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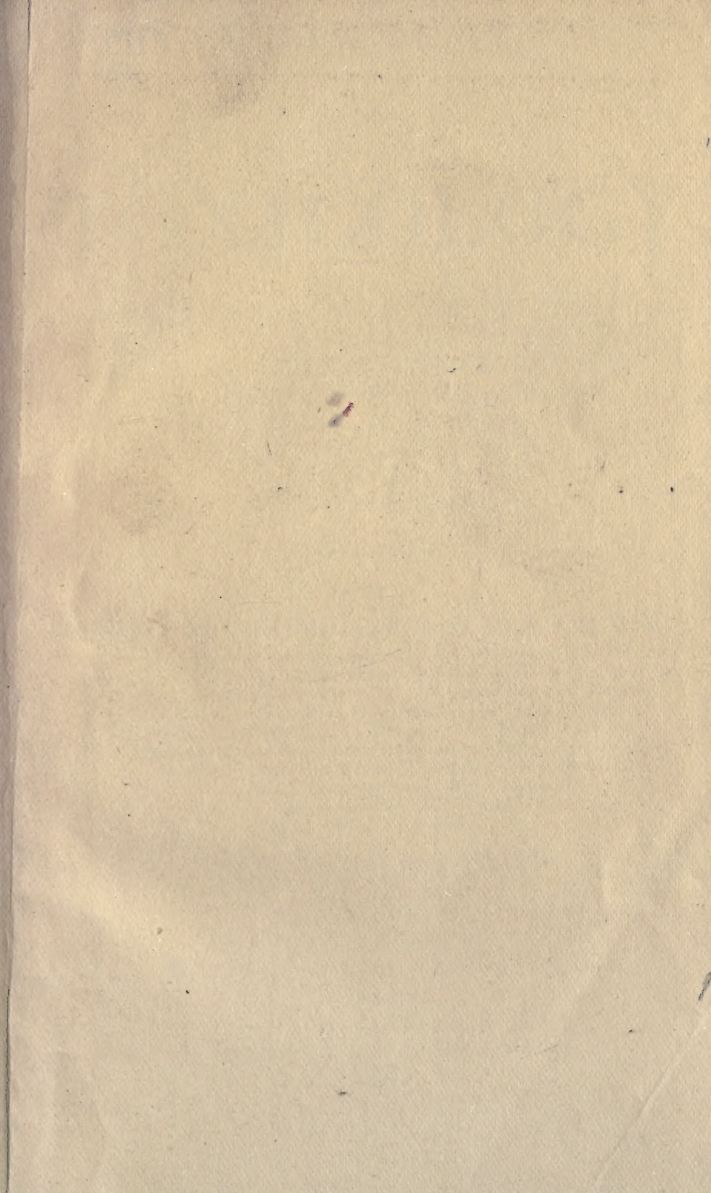
TOXICOLOGY

BRUNDAGE



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MM A MANUAL
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OF

TOXICOLOGY

A CONCISE PRESENTATION OF THE PRINCIPAL FACTS RELATING TO POISONS, WITH DETAILED DIRECTIONS FOR THE TREATMENT OF POISONING. ALSO A TABLE OF DOSES OF THE PRINCIPAL AND MANY NEW REMEDIES

By

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DEDICATED TO THE MEMORY
OF
MY MOTHER,
SARAH MERVINA BRUNDAGE,
WHOSE ATTAINMENTS AND NOBILITY OF CHAR-
ACTER HAVE BEEN THE INSPIRATION
AND BENEDICTION OF MY LIFE.



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PREFACE TO SIXTH EDITION.

Alterations and additions are offered, in this edition, in keeping with the advances made in toxicology since the publication of the former edition.

The author's experience in teaching experimental toxicology to laboratory classes has been quite extensively drawn upon in the laboratory suggestions offered. Increasing experience stimulates a demand for simplified construction and methods. When such are secured without loss of clearness and accuracy and are associated with comprehensive and apt illustration, the best interests seem to be conserved.

It is the author's hope that this book, in at least some degree, distinctly embodies these desirable features.

ALBERT H. BRUNDAGE.

MILWAUKEE, WIS., August 8, 1908.

PREFACE TO FIFTH EDITION.

Since the last edition of this book was published, there have been some important advances made in the field of toxicology. There is also a growing demand for laboratory demonstration and work in animal toxicology at our leading professional schools.

These facts, in conjunction with the very generous favor and recognition afforded this book thruout the country, induce the author to offer this new edition.

ALBERT H. BRUNDAGE.

MILWAUKEE, Wis., October 2, 1907.

PREFACE TO FIRST EDITION.

Toxicology is a subject of vital importance to the physician, the pharmacist, and the public. A life often depends upon a physician's thorough and ready knowledge of the subject. The public demand of the pharmacist such a knowledge of this subject as shall enable him to recognize and protect against possible errors in prescriptions. They also expect him to be competent to afford prompt, intelligent, and efficient emergency treatment in cases of poisoning. Various medical and pharmaceutical colleges, and boards of pharmacy, also require a knowledge of Toxicology for their examinations.

Although there are many excellent books upon Toxicology, providing invaluable means for studying it, and for extended investigations in it, nevertheless none of them seem to have satisfactorily provided for the immediate and practical requirements of students, pharmacists, and physicians.

There seems to be a demand for a book which will serve as a ready means of review of the salient points of the subject, and as a convenient, condensed emergency reference. This Manual of Toxicology, which is intended by the author to replace the Toxicology-Memoranda which he originally prepared for the use of students in the Brooklyn College of Pharmacy and others, has, therefore, been prepared by him to provide for the apparent demand.

Inasmuch as Toxicology is essentially and inseparably associated with the subject of dosage, the

author has introduced a table of doses of the principal and of many new remedies.

There is a wide divergence of opinion as to what constitutes the proper minimum and maximum doses of various remedies, and the student is, therefore, often in doubt as to what doses to adopt. In the effort to relieve him of this embarrassment, the author has reviewed the leading authorities on doses and has endeavored to offer to the student the opinion of the majority by the dose given in the Dose Table of this Manual.

In the effort to emphasize important words and phrases for emergency and other purposes, capitals and bold-face type have been freely used throughout this book.

The author desires hereby to express his appreciation of valued assistance afforded him by Prof. Elias H. Bartley, B.S., M.D., in the preparation of this book.

In conclusion, the author entertains the hope that although his book may have many imperfections, it will nevertheless prove both useful and helpful.

ALBERT H. BRUNDAGE.

1073 BUSHWICK AVE.,
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SEPTEMBER 30, 1901.

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A MANUAL — OF — TOXICOLOGY

PART I.

GENERAL CONSIDERATIONS.

Toxicology is the science which treats of the nature, properties, effects, and detection of poisons, and the treatment of poisoning.

A Poison may briefly be said to be: Any substance which, independent of any mechanical action, uniformly causes disease or death, when applied to, introduced into, or developed within the body.

Because a certain person is peculiarly susceptible to the action of a certain substance and therefore has what is termed an idiosyncrasy regarding it, and is injuriously affected by it, or is diseased and consequently so affected, while others in health are not injuriously affected by it, that substance is not therefore to be classed as a poison. Nor is it the avenue by which a poison enters the body (the mouth, lungs, skin, ear, nose, or otherwise) which determines that **it is a poison**. **Its effects**, and uniform ones, are what cause it to be classed as a poison.

It has been proposed to recognize as a poison any substance which produces harmful effects in quantity of a drachm or less.

A Corrosive Poison is one which causes local destruction of tissue. Such poison, when swallowed, usually produces nausea, vomiting, and great local distress. **A Corrosive Poison** is not strictly a true poison. If the **Corrosive Poison** be highly diluted with water it ceases to be corrosive (e.g., Nitric Acid).

A True Poison, in the strictest sense, is one which, when absorbed by the system, uniformly causes disease or death. No matter how highly diluted, it is still poisonous (e.g., Atropine, Strychnine, etc.).

A Cumulative Poison is one which increases suddenly in its intensity of action after slow additions of it (e.g., Digitalis).

THE LEGAL DEFINITION OF "POISON."

The legal definition of "**POISON**" is very succinctly and clearly stated by Kobert as follows:

The statutes of the State of New York and those of the United States, do not define the word "poison." Words are there used to indicate their general meaning, unless something is found in the context to denote some special or restricted use.

According to its generally received meaning, we can say: In most cases a poison is a substance which, when given even in small doses, owing to its chemical constitution, is capable of destroying health or life.

The following statement, by Herold, very concisely expresses the generally accepted scientific and legal views of this matter:

A Poison is a substance which, when applied to the body externally, or introduced into the system either by the mouth, rectum, vagina, skin, lungs, etc., without acting mechanically, but by its own inherent qualities, is capable of altering or destroying some or all of the functions necessary to life.

The intent with which such a substance is given enters into the legal conception of a poison. The law never regards the manner in which a substance acts, and it is of little consequence, so far as the responsibility of the accused person is concerned, whether its action on the body be of a mechanical or of a chemical nature, so long as the substance administered is capable of causing disease or death. Broken or crushed glass, needles, pins, and like bodies are not poisons in the medical signification of the term; yet, when taken inwardly, may be destructive to life. Any substance which causes disease or death, given with homicidal intent, may be regarded as a legal definition of a poison.

The English law declares that: "Whoever shall administer, or cause to be administered to, or taken by any person, any poison or other destructive thing, with intent to commit murder, shall be guilty of felony." And also: "That whosoever shall unlawfully or maliciously administer to, or cause to be taken by, any other person any poison or other destructive or noxious thing, so as thereby to endanger the life of such person, or so as thereby to inflict upon such person any grievous bodily harm, shall be guilty of felony;" and "Whoever shall unlawfully apply, or administer to, or cause to be taken by, any person any chloroform, laudanum, or other stupefying or overpowering drug, matter, or thing, with intent, in any such case, thereby to enable himself or any other person to commit, or with intent, etc., to assist any other person in committing, any indictable offence, shall be guilty of felony."

The German statute provides that: "Whoever wilfully administers (beibringt) to a person, for the purpose of injuring health, poison, or any other substance having the property of injuring health, will be punished by from two to ten years' imprisonment. If by such act a serious bodily injury is caused, the imprisonment is not to be less than five years; if death is the result, the imprisonment is to be not under ten years or for life."

If the death is wilfully caused by poison, it comes under the general law: "Whoever wilfully kills a man, and if the killing is premeditated, is on account of murder punishable with death."

The French law (Art. 301, Penal Code) says: "Every attempt on the life of a person, by the effect of substances which may cause death, more or less suddenly, in whatever manner these substances may have been employed or administered, and whatever may have been the results, is called poisoning."

There is also a penalty provided against any one who "shall have occasioned the illness or incapacity for personal work of another, by the voluntary administration, in any manner whatever, of substances which, without being of a nature to cause death, are injurious to health."

Blyth's scientific definition of a poison is: "A substance of definite chemical composition, whether mineral or organic, may be called a poison, if it is capable of being taken into any living organism, and causes, by its own inherent chemical nature, impairment or destruction of function."

Acute Poisoning is produced by taking an exces-

sive single dose of a poison, or several smaller doses with such frequency as to result in prompt and marked disturbance of function or death within a definite time.

Chronic Poisoning is produced by taking or absorbing for a protracted period small doses of a poison, thereby producing gradual but progressive deterioration of function or tissue (e.g., By lead, morphine, etc.)

An Antidote (in a general sense) is any agent which neutralizes a poison, or otherwise counteracts or opposes it or its effects. It may either so alter a poison as to make it harmless, remove it from the body, mechanically prevent its absorption, or so act upon the functions of the body as to more or less overcome the effects of its absorption. There are three kinds of antidotes: Chemical, Mechanical, and Physiological.

A Chemical or True Antidote is one which makes the poison insoluble or harmless by chemically altering it. (It acts directly upon the Poison.)

A Mechanical Antidote or Antidotal Measure is one which removes the poison without changing it, or so coats the stomach or mechanically suspends the poison that absorption is prevented. (It acts directly upon or against the Poison.)

A Physiological Antidote or Antagonist is an agent which so acts upon the system as to counteract, more or less completely, the effects of another substance (e. g., atropine counteracts the effects of morphine, to a certain extent). (It acts directly upon the functions of the body.)

In a strict sense, a measure which tends to overcome the remote systemic effects of a poison, (as artificial respiration, cold affusions, etc.), is not an antidote, but a **Physiological or Antagonistic Measure**.

A Medicine is a substance administered to correct a disordered or diseased state of the system.

Posology treats of the form and quantity of medicine to be administered at one time, or within a certain period.

A Dose is the quantity of medicine to be administered at one time or within a certain period, usually

a day. It may be a single, or daily dose, a safe, or poisonous dose, a minimum, or maximum dose, a mouth, hypodermic, or rectal dose, etc.

Only a certain amount of some medicines may safely be administered in twenty-four hours; therefore, the daily dose may be disproportionate to the single dose. (See dose tables in Appendix.)

A Safe Dose may be useless if too small; consequently a dose called the **Minimum Dose** is fixed as the smallest amount from which physiological effect is commonly assumed to result, or beneficial action upon the sick is secured.

No arbitrary quantity of a poison can be stated above which it is poisonous, and below which its effects are both safe and salutary. (2 grains of arsenic or $\frac{1}{2}$ ounce of oxalic acid may be fatal.)

A Toxic or Poisonous Dose is the dose that is harmful to both the healthy and the sick, but is not fatal. It begins where the limit of safety, commonly called the **Maximum Dose**, ends.

A Lethal or Fatal Dose is the dose which kills, and although ordinarily more, may, under certain conditions, be less than the ordinary maximum dose.

Considering the foregoing facts, it is important that the **Minimum and Maximum Doses** of medicines be well known, and especially that the **Maximum Doses** be not exceeded except for some special reason, lest poisoning result.*

EFFECTS OF POISONS.

Poisons may have local or remote effects, or both.

The **local** effect of a poison is the impression made directly upon that part of the body with which the poison comes in contact: Such as corrosive effects produced upon stomach and intestines by immediate contact of concentrated mineral acid or caustic alkali; or irritative, inflammatory, or local specific effect of such substances as corrosive sublimate or aconite.

The **remote** effect is the impression made upon a

*The author has arranged a *Table of Doses* of the principal and many new remedies. This table will be found in the *Appendix*.

distant part of the body (e. g., belladonna taken into the stomach produces paralysis of the ciliary nerves resulting in dilatation of the pupil of the eye). The usual **symptoms** of poisoning are the **remote** effects of the poison.

Certain poisons, such as arsenic, carbolic acid, potassium cyanide, etc., have both local and remote effects; e.g., arsenic has a local effect upon the stomach, and a remote effect upon the brain; cantharides locally produces blisters, remotely influences the kidneys and bladder, causing strangury and sometimes bloody urine.

A Poison, unless it be a corrosive poison, must first pass into the blood, that is, it must be absorbed into the general circulation, and be carried to distant parts of the body, in order to produce its full effects upon the system. Some poisons are more rapidly taken into the general circulation than others. **The corrosives often produce local effects so severe as to cause death.** (See colored plates.)

Poisoning cannot occur by nervous communication or by simple approximation of tissue.

We know that poisons are absorbed into the circulation because we find them in the blood, secretions, and various organs of the body, such as the kidneys, liver, spleen, brain, lungs, etc.

Some poisons are absorbed without undergoing any change, and pass out of the circulation and body still unchanged. Some are chemically altered during absorption, or in the blood or organs, and thus destroyed. Some so alter the blood as to make it unfit to perform its functions.

The statement that when a poison enters the blood it probably causes some change in that fluid, has been to a certain extent confirmed:

According to Da Costa, the following effects of different poisons on the condition of the blood have been recognized:

<i>Substance.</i>	<i>Effects.</i>
Alcohol,	Anemia, often leukocytosis.

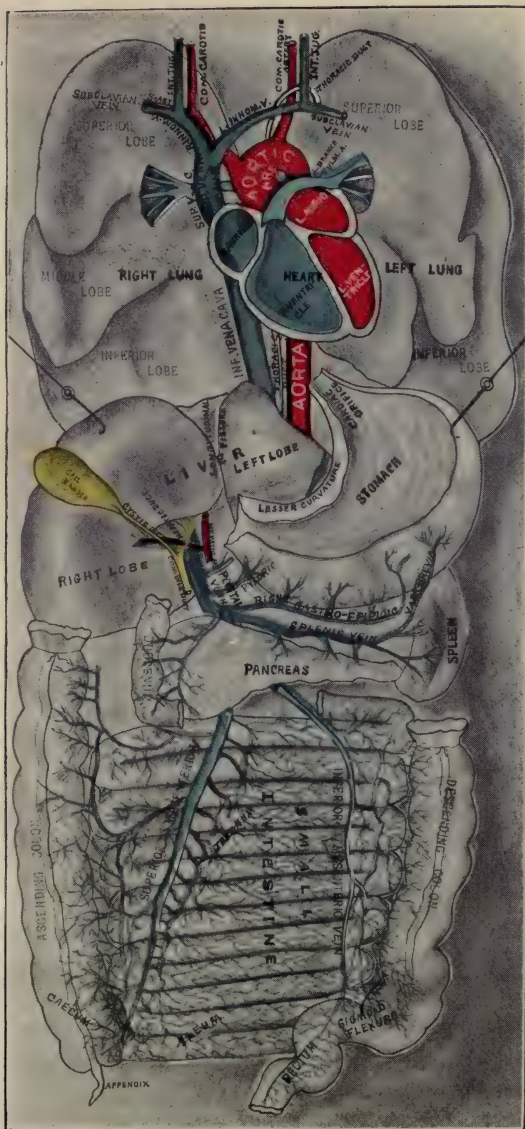
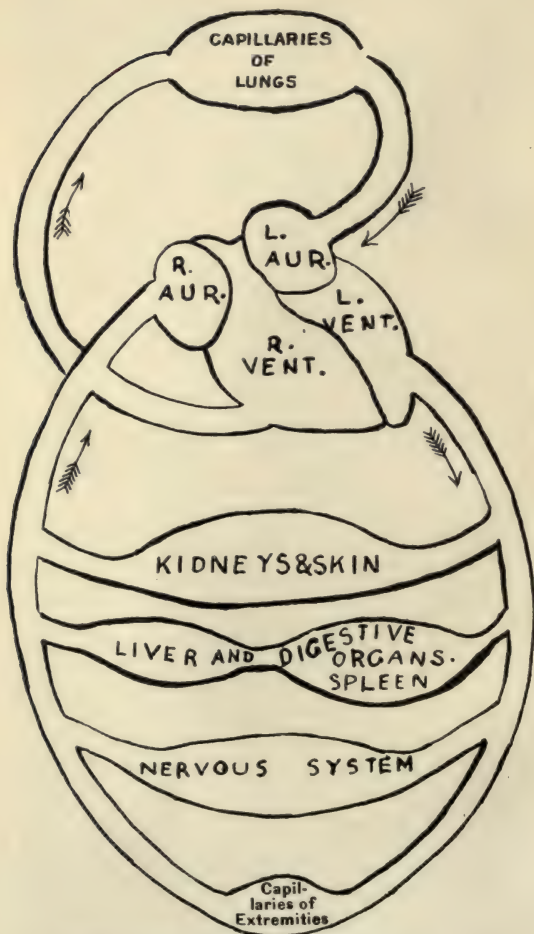


Diagram showing chief organs concerned in absorption and excretion.

A MANUAL OF TOXICOLOGY.



Diagrammatic scheme of circulation. (See p. 16.)

<i>Substance.</i>	<i>Effects.</i>
Amyl nitrite,	Methemoglobinemia.
Acetanilid,	Methemoglobinemia.
Ammonium hydroxid,	Leukocytosis.
Antipyrin,	Methemoglobinemia.
Bromin,	Methemoglobinemia.
Chloral,	Leukocytosis.
Chromic acid,	Methemoglobinemia.
Ether,	Oligochromemia,
Guaiacol,	Hemocytolysis, leukocytosis.
Hydrogen cyanid,	Methemoglobinemia.
Illuminating gas,	Methemoglobinemia, polycythemia.
Iodin,	Leukocytosis, methemoglobinemia.
Lead,	Anemia, granularbasophilia, often leukocytosis.
Nitrobenzene,	Methemoglobinemia, megaloblastic anemia.
Nitroglycerin,	Methemoglobinemia.
Phenacetin,	Methemoglobinemia.
Phosphorus,	Polycythemia, occasionally leukocytosis.
Potassium chlorate,	Methemoglobinemia, anemia, leukocytosis.
Sodium nitrite,	Methemoglobinemia.
Poisonous mushrooms,	Hemoglobinemia.

In toxicological examinations, it is important to find the poison in some of the secretions or organs of the body.

Poisons may be absorbed with remarkable rapidity, especially if hypodermically injected.

The rapidity of absorption depends upon—

1. The solubility of the poison.

If it is absolutely insoluble it cannot be absorbed. But although insoluble in water it may be soluble in the fluids of the alimentary canal and consequently be absorbed.

There are some poisons of an animal nature, which, if swallowed, seem to undergo a change by digestion or otherwise which makes them practically harmless: (e. g., the virus of glanders, smallpox, syphilis, etc.).

2. The character of the surface to which the poison is applied.

Poisons may enter the system through the skin, as by the use of washes and salves (e. g., such poisons as arsenic, tartar emetic, corrosive sublimate, opium, etc.).

If the skin is removed beforehand, the absorption is of course more rapid. If the surface is rich in blood vessels and the intervening walls thin, the poison is likely to be very promptly taken up. When poisonous vapors or gases are inhaled, the effects are exceedingly prompt, because of the rapidity of absorption in the respiratory tract. Poisons act more rapidly when given by the mouth than by the rectum; and still more so when given by hypodermatic injection; when injected directly into the blood vessels of the body they have an almost instantaneous effect. A poison taken into the stomach when the latter is full of food usually acts very slowly, or may expend its power upon the contents (potassium permanganate introduced into a stomach containing much organic matter expends its oxidizing power upon such matter); but if the stomach is empty the action is usually very prompt, and apt to be directed against the walls of the stomach.

3. The quantity of blood in the blood vessels quite materially influences the rapidity of absorption.

If the vessels contain but little blood, the poison is more rapidly absorbed. The less circulating fluid there is, the more rapid the absorption. Therefore, bleeding or purging will favor absorption by producing depletion of the vascular system.

It is evident that the fatal effects of a poison are due to absorption, inasmuch as the poisoning continues as long as the blood circulates between the place where the poison has been introduced and the organ affected by it. Also by the fact that the effect ceases when the circulation, from the place where the poison was introduced, has been cut off. This has been proved by various experiments upon animals.

As a poison, which has been absorbed into the blood, passes through the different organs of the body, some of it is at once separated by them and promptly removed in their secretions, such as the

saliva, urine, sweat, bile, pancreatic juice, etc. The kidneys remove many poisons, and should be aided.

Some of the poison may, however, be temporarily deposited in the liver, spleen, kidneys, heart, lungs, brain, pancreas, muscles, or bones. This is true of mineral and some vegetable poisons. Gaseous poisons are not deposited, but promptly removed by way of the lungs. Lead and some other mineral poisons are particularly inclined to deposit in the spinal cord and brain. These various depositions are invariably in the form of an albuminoid combination. A poison which is not known to have any selective action is most likely to be found in either the liver or kidneys.

Although only a small portion of a poison circulates in the capillaries at any one time, it is really this portion which produces the poisonous effects. **That portion which is still in the stomach or otherwise unabsorbed, or has been temporarily deposited in the various organs, is harmless while it remains there.**

Hence, an **unabsorbed poison** in the stomach is **not the cause of death** as is commonly supposed. The **cause of death** is that portion of the poison which is **absorbed**; and the unabsorbed portion in the stomach is the surplus of what was capable of producing death. **Exception** is, of course, made regarding the **local action of corrosives**.

A poison which is, for the time being, deposited in the organs, is harmless while there, but is nevertheless a menace to life, as it may at any time be reabsorbed and thus become again active. It is therefore evident that a poison should be entirely removed from the system as soon and as completely as possible.

The length of time required for the removal of an absorbed poison from the circulation, either by the secretions or by its being deposited in the organs or tissues, depends upon the poison and the state of the system. Potassium iodide, turpentine, antimony, and carbolic acid may often be found in the urine a

few minutes after being swallowed. It is believed that mineral poisons are rapidly separated from the blood. Lithium salts pass through the entire circulatory system within a few minutes after being given and may be detected in the perspiration. Arsenic has been found in the urine within an hour and an half and in the liver within four hours after it was taken. It takes nearly two weeks to remove it from the system. Antimony may be found four months, and lead and copper eight months after they have been taken.

Early vomiting and purging after only a moderate dose of poison may prevent the deposition of the poison, but without saving life, there being just enough poison absorbed to kill.

As the various **poisons** circulate throughout the body in the blood, they come in contact with the great centres of life—the heart, lungs, brain, and spinal cord,—and **exert their influence upon those organs, which are peculiarly sensitive to their actions,** or show their elective affinity for various organs and **produce their specific effects**; one, as opium, affecting the brain producing narcotism; another, as prussic acid or digitalis, the heart, producing asthenia; another, as strychnine, the spinal cord, producing tetanus, etc. Morphine given hypodermatically promptly seeks the stomach; mercury applied to the skin in the form of a salve promptly seeks the small intestine, etc.

We do not know why they so act any more than we know why different poisons prefer different methods of removal from the system; as, potassium iodide prefers removal by the urine, mercury by the saliva, arsenic by the stomach glands, lead by the secretions of the liver and kidneys, etc.

Death by poisoning may result **from shock** to the general nervous system, or from a specific disturbance of some vital organ or center of life, as **from paralysis of the heart, paralysis of the respiratory centers, asphyxia,** etc.

The strong corrosives produce death by shock through their severe local action, producing a gen-

eral depression of the system like that caused by a severe burn or other serious injury to the surface of the body. Most poisons cause death by producing a general devitalizing effect.

The effects of a poison may be modified by the physical state, quality, or mode of administration of the drug, the size of the dose, the association with other poisons, the age, sex, idiosyncrasy, habit, or mental or physical state of the individual, the condition of the stomach, and the character and amount of the stomach contents.

Men as a rule bear larger doses of medicines than women.

As a general rule, the larger and more robust the individual, the less easily he is influenced by drugs, and the greater his vital resistance.

Regarding mode of administration, it is well known that dilute diuretics are more effective than concentrated ones; but saline purgatives are most effective when concentrated. Of alcoholic, watery and oily solutions, the first is most readily absorbed, the last least so. Hot solutions are usually more rapidly absorbed than cold ones. Dilution of a poison by water frequently favors its speedy absorption, hence the promptness and severity of its action; to this, corrosives are exceptions.

A poison is absorbed more rapidly in gaseous than in solid or even liquid state; consequently it is most active in gaseous, less active in liquid, and least active in solid state. A diseased or disordered stomach may delay absorption of a poison or prove highly susceptible to the action of an irritant poison; or acidity, alkalinity, or other character of its contents may determine the solution, absorption, destruction or intensity of action of a poison (e. g., an acid or alkali may be neutralized; mercurous chloride may be decomposed by an alkali thereby acting severely).

Certain toxalbumins, such as snake venom, are almost or quite inert when taken into stomach, but very poisonous if introduced directly into the blood.

Some poisons have severe irritant effects in large doses.

Although some substances are very irritant poisons in large doses, are not in small doses; but if continued, gradually salivate (e. g., certain salts of mercury).

As a rule, the **larger the dose, the quicker and oftentimes more emphatic the action.** Some irritant substances, however, act as **emetics in large doses**, while **small ones have no emetic effect**, and consequently remain and poison; as, for instance, arsenic.

A large dose of a poison may also cause death in a different way from a small dose. Oxalic acid in a large dose quickly produces death by shock; in small doses, it slowly kills by its action upon the heart and nervous centers.

Combining poisons sometimes increases (as morphine with chloral), sometimes diminishes, their power; or, their action may actually be antagonized or neutralized by such combining. The action of one poison may be suspended by the action of the other.

The **antagonistic action** of poisons is well known. Certain poisons decidedly antagonize each other, one more or less neutralizing the effect of the other upon the system.

The antagonistic action may be either physiological or toxic. Calcium salts in poisonous doses will produce such contraction of a frog's heart that the animal dies—the heart contracted. Potassium salts in poisonous doses produce dilatation of the heart, and death in that state. A balance dose of the two salts will control the action of each salt, the physiological effects of one being neutralized by the other, so that the heart acts normally and the animal lives. There is a similar antagonism between the potassium salts and veratrine. Morphine, aconite, and conium are more or less neutralized, respectively, by atropine, digitalis, and strychnine. And atropine neutralizes strychnine. Furthermore, a combination of poisons may so modify the action upon the system as to obscure the symptoms, and even interfere with the chemical tests.

As indicated in the foregoing, among others, such conditions and peculiarities of the system, as **Habit**,

Idiosyncrasy, and **Disease** modify the action of poisons.

Habit, as a rule, lessens the effect of poisons; (e. g., opium, alcohol, arsenic, etc.) Gradual increase in dose of a poisonous substance, commonly, produces toleration of that substance.

With vegetable substances, such as opium and gelsemium, it is usually necessary to increase the dose frequently to maintain the effects; however, with mineral substances, the contrary is, as a rule, the case; antimony and mercury cannot be long taken without risk.

Idiosyncrasy (constitutional peculiarity; distinctive characteristic; personal susceptibility or tolerance, respecting certain poisons) is noted when morphine, calomel, etc., are administered to some persons.

Some persons are affected by the tonic influences of even minute doses of arsenic; some are salivated by a minute dose of a mercurial; some are poisoned by a very small amount of turpentine. Other persons cannot take the iodides; with some, even quite dilute solutions of cocaine applied to any mucous membrane will cause severe symptoms of poisoning; opium produces wakefulness; etc. Some can take enormous doses.

Some persons are very susceptible to the effects of certain plants, while others are unaffected by them.

Some cannot take quinine, others opium or belladonna, etc. Some persons are made seriously ill by partaking of, or only smelling, substances which are very agreeable to others; among these are various drugs, and such foods as fish, eggs, honey, lobster, and other shell-fish, mutton, raspberries, strawberries, etc.; also the odors of musk or of sewer gas, the smell of various animals, the scent of flowers, etc. Among the symptoms produced are: Nettle-rash after partaking of raspberries, strawberries, tomatoes, crabs, or other red dishes; sneezing in the presence of the obnoxious animals; colic after cocoa; fainting, illusions, and other nervous phenomena from the scent of the lily, rose, violet, hyacinth, etc.

Disease also modifies the action of certain poisons; as, opium in tetanus, peritonitis, delirium tre-

mens, etc., where the power of the poison is diminished; or, as opium in apoplexy and inflammation of the brain, where tolerance of it is lessened. In paralysis, strychnine acts less readily. In typhoid fever very large doses of alcohol are tolerated. In organic disease of kidney, lessened eliminative power seems to increase susceptibility to poisons.

Sleep usually diminishes or retards the action of poisons, owing to diminished vital functions (e. g., arsenic and other irritants). Exhaustion usually increases the susceptibility to certain poisons, particularly those having a depressing effect.

In maniacs and in some convulsive disorders, sedatives may be almost inactive.

The **Evidences of Poisoning** may be divided into:

1. Circumstantial, or Moral.
2. Symptomatic.
3. Chemical.
4. Post-Mortem.
5. Experimental.

1. Circumstantial or Moral Evidence is that contributed by the circumstances or deduced from various occurrences and facts. Among these are motives for poisoning; the possession or purchase of the particular poison found; previous attempts to poison; active efforts for secrecy regarding medicine used, or matters vomited; undue haste in burial, etc.

2. Symptomatic Evidence is that contributed by the symptoms. It may be subjective or objective. While it is very important in determining a poisoning, it is, nevertheless, only presumptive evidence of poisoning. There are no absolutely characteristic symptoms of any poison. If such were not the case, symptoms would be determinative evidence, and chemical investigation unnecessary. The local action of strong mineral acids and alkalies may, however, be considered an exception.

Inasmuch as most poisons act very promptly, the occurrence of severe symptoms, such as violent pain, vomiting, purging, convulsions, delirium or drowsiness, soon after a person, previously in a state of health,

has taken food or drink, indicates cause for investigation. And even if the symptoms come on gradually and are supposed to be caused by disease, they may be due to slow poisoning resulting from taking small repeated doses of a poison. Furthermore, the symptoms or other evidences of certain poisons resemble those of certain diseases or disorders. Irritant poisoning is simulated by cholera morbus, food poisoning, malignant cholera, gastro-enteritis, peritonitis, gastric and intestinal ulceration, strangulated hernia, etc. Narcotic poisoning is simulated by autoinfection, epilepsy, apoplexy, meningitis, tetanus, certain heart diseases, etc. It is also well known that intoxication will mask the effect of narcotics. Arsenic poisoning and cholera morbus give very similar symptoms. Opium poisoning may be quite readily mistaken for apoplexy or uremia. The symptoms of strychnine poisoning and tetanus are very similar.

3. Chemical Evidence is the evidence obtained by means of a chemical analysis of the substance supposed to have caused the poisoning, or of that which has been vomited, or of material found in some part of the body, or in its excretions.

The consideration of the physical properties of the suspected poison should be associated with the chemical investigation.

Poison found in the stomach has in some cases been introduced there after death. Care must, therefore, be exercised to exclude such possibility.

There is no known distinctive chemical test for certain poisons. Consequently those poisons cannot always be identified.

Furthermore, the poison may have been decomposed in the blood or tissues, or so thoroughly eliminated or otherwise removed as not to be discoverable.

The more unstable of the alkaloids and organic poisons are known to be oxidized while passing through the lungs. It is believed that many poisonous principles, which enter the blood, are either destroyed or their effects neutralized by the white blood corpuscles.

Sometimes the chemical investigation is interfered with by the presence of certain ptomaines.

Ptomaines (Animal Alkaloids, Cadaveric Alkaloids, or Putrefactive Alkaloids) are alkaloidal substances, resulting from the decomposition of albuminous materials under the influence of bacteria. Some ptomaines are poisonous, the majority are not. Ptomaines have been found in mussels, oysters, eels, sausage, ham, canned meats, etc. Tyrotoxinon is a ptomaine from poisonous cheese, poisonous milk, poisonous cream, etc.

A **Toxin** is a poisonous substance or mixture of substances produced by bacterial action. It may be an alkaloid or proteid substance with poisonous properties, or a mixture. The term toxin is usually restricted to poisonous proteid substances produced by disease producing microorganisms—as diphtheria toxin, or tetanus toxin. In a crude way, bacteria may be likened to bees and toxins to their honey.

Food Poisons: Certain foods, when undergoing decomposition, may become poisonous from development of ptomaines or toxins. Symptoms of food poisoning are usually those of a gastro-intestinal irritant.

4. **Post-Mortem Evidence** is that obtained by an examination of the organs and tissues of the body after death. In post-mortem absorption the poison is found chiefly in the external portion of the organ. In ante-mortem absorption the blood circulation and other vital processes would produce more uniform diffusion throughout the interior of the organ. If evident changes in the histological character of the organ are observed, it is presumptive evidence of ante-mortem introduction of the poison. Perforations produced by corrosives are invariably large and ragged, while those caused by disease are, as a rule, small with smooth edges. But, inasmuch as certain diseases simulate certain poisons, a post-mortem examination is not altogether a positive evidence of poisoning.

Redness, ulceration, softening of the mucous membrane of the alimentary canal, and perforation, are the principal evidences encountered post-mortem.

Irritants produce their chief effects upon the stomach and intestines, causing irritation, inflammation and corrosion; they sometimes produce ulceration, perforation, and even gangrene. They may cause thickening or thinning, and softening of visceral walls.

The post-mortem appearances resulting from the narcotic poisons are not well defined.

Poisons which are narcotico-irritant in their effects, may affect either or both the alimentary canal and brain. Death may result from irritants or narcotics without producing any appreciable post-mortem changes.

Redness of mucous membrane of stomach and small intestine may be post-mortem sign from the action of an irritant poison, or from disease, suffocation, drowning or strangulation. A deep red color of the stomach wall is sometimes caused by transudation of blood from liver or spleen. Gravitation of blood, also, sometimes causes a similar appearance in intestinal wall.

Ante-mortem symptoms or some chemical evidence is therefore important.

In ulceration of stomach from irritant poison, mucous membrane usually is destroyed in small circular patches, and redness from ulceration is diffused; not diffused when from disease. Stomach mucous membrane softening is not characteristic of poisoning. Disease produces same. When caused by corrosives, mouth, etc., will invariably show effects of poison.

Perforation may result from poison or disease, and follow corrosion or ulceration. As said, in perforation from disease, opening is usually small, oval or rounded, with smooth edges; from acids, large and ragged. The diaphragm, stomach, spleen, liver and other viscera sometimes spontaneously soften. The preceding facts indicate necessity for caution in drawing conclusions from post-mortem appearances.

5. Experimental Evidence is evidence obtained by administering the suspected substance to some living animal and observing the effects. Apparently only dog and cat similarly affected as man by same poisons, but fatal dose, rapidity of action, rate of absorp-

tion, deposition or elimination of a poison administered to man cannot be determined by experiments upon the lower animals. But the administration of a suspected substance to a lower animal may serve as corroborative evidence of the poisonous nature.

But such facts as the following should not be overlooked : A rabbit can take more morphine than a man who weighs fifty times as much ; amygdalin kills rabbits, but has no effect upon dogs ; an adult man cannot bear as much strychnine as the smallest snail ; insects are unaffected by many of the strongest heart poisons ; the hedgehog is unaffected by bite of the most venomous snake, and is not injured by large doses of hydrocyanic acid or of cantharides ; although the frog is easily affected by the digitalis poisons, the toad is quite unaffected by them ; dogs can take more morphine than most men ; etc.

THE CLASSIFICATION OF POISONS.

It is almost impossible to arrange a satisfactory classification of poisons. In an ideal one the same poison would appear but once, and the line between each poison would be sharply drawn.

Some writers upon toxicology classify poisons according to the kingdoms ; that is, as animal, mineral, and vegetable poisons. Poisons have also been classified as organic, mineral, and volatile poisons. But these classifications have proved unsatisfactory. A quite satisfactory classification, based upon the origin or nature of poisons, but somewhat less definite than the author's Chemical Classification, arranges poisons as : (1) Inorganic, (2) Alkaloidal, (3) Non-alkaloidal Organic, (4) Gaseous, (5) Food Poisons.

Poisons may very advantageously be classified either **physiologically** or **chemically**.

Physiological classification usual and most satisfactory. Is based upon effects of poisons upon healthy animal, or upon system when in healthy condition.

Chemical classification is a classification based upon chemical composition or chemical behavior.

The author herewith presents a new physiological and also a new chemical classification which, he believes, will be found useful. But for the reader's convenience, Tanner's, Blyth's, and Kobert's classifications are also presented.

PHYSIOLOGICAL CLASSIFICATION OF POISONS.

1. IRRITANTS.	True Irritants.	Bromine; Cantharides; Carbolic Acid; Creosote; Croton Oil; Castor Beans; Chlorine; Compounds of Antimony, Arsenic, Copper, Chromium, Iron, Lead, Tin and Zinc; Food Poison; Gelsemium; Hellebore; Iodine, Mushrooms; Phosphorus; Ptomaines; Savin; Trichina; Veratrum, etc.	
		Corrosives. { Acetic, Carbolic, Chromic, Lactic, Oxalic and Salicylic Acids; The concentrated mineral acids; Creosote; Corrosive Sublimate; Concentrated Lye; Potassium Chlorate; Potassium Nitrate; Potassium and Sodium Hydroxides and Carbonates; Quick Lime; Soluble Salts of Barium; Water of Ammonia, etc.	
2. NEUROTICS.	Cerebral.	Narcotics.	Alcohol; Apocynum; Belladonna; Chloral; Chloroform, Ether, etc. (Anesthetics); Carbonic Oxide; Carbon Dioxide; Opium, etc.
	Spinal.	Tetanics.	Nux Vomica, Strychnine, Brucine; Ignatia; Thebaine, etc.
	Cerebro-Spinal.	Deliriants.	Belladonna; Camphor; Cannabis Indica; Cocaine; Fishberries (Picrotoxin); Fungi; Hyoscyamus; Stramonium; Solanine, etc.
		Depressants.	Arnica; Antipyrine; Phenacetin, and many other Phenol and Benzene derivatives; Colchicum; Cocaine; Hemlock; Lobelia; Tobacco (Nicotine).
		Asthenics.	Aconite; Conium, Curare, Physostigma, Poke Root (Paralyzants); Digitalis; Fishberries (Picrotoxin); Gelsemium; Hydrocyanic Acid; Nitro-Benzol; Pink Root; Potassium Cyanide; Veratrum Viride; Animal and Insect Poisons, etc.

IRRITANTS.

An Irritant Poison is one which produces irritation or inflammation. When swallowed such poison produces an irritant effect upon the mucous lining of the alimentary canal, resulting in nausea, vomiting, purging, pain in the abdomen, cramps in the stomach and other parts of the body. Sometimes blood accompanies the vomited or purged matters.

The post-mortem changes are found to be more or less inflammation of the gastro-intestinal mucous membrane. Sometimes ulceration, perforation, and gangrene result.

A Corrosive Poison is a highly active Irritant Poison and causes local destruction of tissue. Such poison, when swallowed, usually produces nausea, vomiting and great local distress.

NEUROTICS.

A Neurotic Poison is one which acts chiefly upon the nervous system. Although highly diluted with water it continues to be poisonous. It is a true poison in the strict sense.

The symptoms are directed especially to the brain and spinal cord.

The chief symptoms are: Drowsiness, giddiness, headache, delirium, stupor, coma, and sometimes convulsions or paralysis.

Cerebral Neurotics affect chiefly the brain.

Spinal Neurotics affect chiefly the spinal cord.

Cerebro-Spinal Neurotics affect both brain and spinal cord.

Narcotics are those agents which produce stupor, complete or incomplete insensibility or loss of feeling. Of these the opium group produce sleep; the belladonna group produce illusions and delirium; the alcohol group produce exhilaration succeeded by sleep or delirium.

Anesthetics (General) are narcotics.

Tetanics are agents which act directly upon the spinal cord, producing such spasmodic and continuous contraction of muscles as result in stiffness or immobility of the parts to which they are attached. The tetanic spasm lasts from one to five minutes, followed by intervals of complete relaxation. Nux Vomica and its alkaloids belong to this class.

Deliriants are those agents which so act upon the brain as to disorder the mental faculties and produce confusion of will power or delirium (such as Belladonna, Hyoscyannes, Stramonium, Solanine, Cocaine, etc.).

Depressants or Sedatives, are agents which retard or depress the physiological action of an organ (e. g., Tobacco, Nicotine, Lobelia, etc.).

Asthenics, or Exhaustives, are agents which produce exhaustion; they cause marked loss of vital or muscular power. A typical member of this class of poisons is Hydrocyanic Acid, which is one of the most deadly poisons. It is found in bitter almonds, wild cherry, peach and apricot kernels, the seeds of apples, and in the flowers and leaves of cherry laurel, peaches, etc.

Some **poisons** have the properties of both a **corrosive or irritant** and of a **neurotic poison** (e. g., Corrosive Sublimate, Arsenic, Carbolic Acid, etc.).

The following-named drugs act directly upon the **heart**: Aconite, Antimony salts, Chloral, Hydrocyanic Acid, Veratrum Viride, Digitalis, Sparteine, Strophanthus, etc. The first five decrease the number and force of the heart beats, the last three increase the force of the heart contractions.

Poisons which affect the heart cause death by sudden shock, collapse, or syncope.

Among **poisonous gases directly affecting the lungs** are: Carbonic-Acid Gas, Chlorine, Illuminating Gas, Muriatic-Acid fumes, Nitrous fumes, Sewer air, Sulphuretted Hydrogen, Sulphurous Oxide, etc. Neurotic symptoms are caused by poisonous gases, through the poisoning of the blood.

CHEMICAL CLASSIFICATION OF POISONS.

1. INORGANIC.	Volatile Non-Metallic Poisons.	{ Bromine; Chlorine; Iodine; Fluorine; Phosphorus; Arseniuretted, Phosphoretted, and Sulphuretted Hydrogen; etc.
	Metallic Poisons.	{ Antimony; Arsenic; Barium; Copper; Lead; Mercury; Silver; Tin; Zinc, etc.
	Mineral Acids.	{ Arsenic, Arsenous, Chromic, Hydrobromic, Hydrochloric, Nitric, Phosphoric and Sulphuric Acids.
	Mineral Alkalies.	{ Ammonium, Potassium, and Sodium, Hydroxides and Carbonates.
2. ORGANIC.	Volatile Organic Poisons.	{ Alcohol; Acetanilid; Aniline and its derivatives; Antipyrine; Phenacetin, etc. Benzene and its derivatives, including Carbolic Acid; Creosote; Carbon Monoxide; Coal Gas; Cyanogen; Picric Acid; Nitrobenzene; Chloral; Chloroform; Coniine; Ether; Hydrocyanic Acid; Nicotine; Sparteine, etc.
	Alkaloids.	{ Aconitine; Apomorphine; Atropine, Brucine; Cocaine; Codeine; Colchicine; Coniine; Curarine; Emetine; Hyoscyamine; Morphine; Narceine; Narcotine; Nicotine; Physostigmine; Pilocarpine; Ptomaines; Sparteine; Strychnine; Veratrine, etc.
	Animal Poisons.	{ Bee, Wasp, and Hornet stings, and bites of various other insects or of animals. Venom of various snakes, such as the Cobra, Copperhead, Rattlesnake, Mocassin, etc.
	Bacterial Poisons.	{ Food Poisons; Ptomaines; Septic Poisons; Toxins.
	Glucosides.	{ Digitalin; Salicin; Santonin; Solanin; Strophanthin, etc.
	Organic Acids.	{ Acetic, Meconic, Oxalic, Salicylic, Tartaric, etc., Acids.

Tanner classifies poisons as:

Corrosives, Simple Irritants, Specific Irritants, and Neurotics; "the last group is, however, further subdivided."

He declares:

The group of *corrosives* should comprehend all poisons which by contact destroy the bodily textures, and so by chemical action alone occasion death.

These same substances, when diluted, may be incapable of destroying the tissues directly, but may do so by setting up inflammation; these, with certain others having like effects, would form the group of *simple irritants*. They kill by virtue of their secondary effects on the constitution. But some substances, like arsenic, are not only capable of inducing local inflammations, with their secondary effects, but are also possessed of certain specific and well-marked properties differing in each case. These are *specific irritants*.

Neurotics comprehend all poisons whose effects are referable to the nervous system, necessarily a most diverse group, which we are not yet in a position to minutely analyze. Some, however, act mainly on the *brain* (*opium*), some on the *spinal chord* (*strychnine*), some on *certain nerves* only (*curare*), or on the *vasomotor system of nerves* (*amyl nitrite*).

There was an old group of *septic* poisons. To this might still be referred certain noxious gases, such as hydrogen sulphide; or were it made to include all poisons acting directly on the blood, it would include the still more dangerous gas, carbon monoxide.

The following table exhibits these subdivisions, and some of the poisons contained in each:

CORROSIVES.	{	Strong Mineral Acids	{	Sulphuric.
				Nitric.
				Hydrochloric.
	{	Vegetable Acids....	{	Oxalic.
		Organic Derivatives		Carbolic Acid.
SIMPLE IRRITANTS.....	{	Alkalies	{	Strong Alkalies.
				Alkaline Carbonates, etc.
				The above diluted.
	{		{	Lime.
				Zinc.
				Silver, etc.

SPECIFIC IRRITANTS....	{	Arsenic.
		Mercury.
		Antimony.
		Phosphorus.
		Iodine, etc.
NEUROTICS.....	{	Opium.
		Prussic Acid.
		Chloroform.
		Belladonna.
		Aconite.
		Strychnin.
		Conium.
		Tobacco.
		Phenol, etc.

CORROSIVE POISONS are characterized by these three things:
 1. *Immediate action.* 2. *Local effects*, such as destruction of *tissue* and *staining*; and in many cases by, 3. *Death* from *shock*.

IRRITANT POISONS give rise to—

1. *Pain in the stomach* and *bowels*. 2. *Faintness* and *sickness*; and 3. *Purging* with *straining*. 4. The evacuations are often tinged with blood. 5. The pulse is feeble and irregular; and 6. The skin is cold.

Many of the substances of this class, from irritating the tissues with which they come in contact, produce a severe burning sensation in the mouth and œsophagus, as well as in the stomach. The degree of local destructive action produced will of course vary in proportion to the amount of the vehicle with which the noxious agent may be diluted. Irritants cause death by inducing collapse or convulsions, or by exciting severe inflammation; or, in some cases, after a variable interval, by leading to stricture of the œsophagus. The diseases which most resemble the action of irritants are, malignant cholera, severe diarrhœa, colic, cholera morbus, gastritis, enteritis, rupture of the stomach or intestines, and obstruction of the bowels, mechanical or otherwise.

NEUROTIC POISONS.—The symptoms of certain diseases bear a resemblance to those caused by some of the poisons of the *neurotic* class. Thus, *belladonna* gives rise to *delirium* with special illusions or convulsions. Sometimes there is *tetanus*, as in *strychnine* poisoning; sometimes *coma* (*opium* and *carbolic acid*), or *syncope* (*digitalis*). Diseases of the brain and spinal chord, likely to be confounded with the effect of these poisons, are often very insidious in their progress, and hence may suddenly give rise to suspicious symptoms. The history,

mode of attack, etc., will generally negative any suspicion of poisoning.

The above facts show the necessity of extreme caution in diagnosing a poison from the symptoms exclusively.

As may be observed in the foregoing table, Tanner places under his first group, **"Corrosives,"** first, the **"strong"** or **"concentrated mineral acids,"** such as sulphuric acid (oil of vitriol), nitric acid (aqua fortis), hydrochloric acid (muriatic acid, spirit of salt), and such **"mixed acids"** as nitro-muriatic (aqua regia), and nitro-sulphuric (aqua reginæ), and also sulphate of indigo; second, the **"corrosive vegetable acids,"** including oxalic acid (the so-called acid of sugar), acid potassium oxalate (salt of sorrel, essential salt of lemons), acetic acid, and tartaric acid; third, the **"corrosive organic derivatives,"** under which he places creosote, and carbolic acid (phenol), and in this connection he also classes the **"derivatives from coal tar,"** such as antipyrin, anti-febrin (acetanilid), phenacetin, salicylic acid, and salol; fourth, the **"caustic alkalies and carbonates"** under which he places potash (potassium hydroxid), potassium carbonate (pearl ash), caustic soda (sodium hydroxid, sodium carbonate (washing crystal), ammonia (ammonium hydroxid), and ammonium carbonate.

Under his second group, **"Simple Irritants,"** he places, 1st. **Salts of potassium, etc.:** Potassium nitrate (nitre, saltpetre, sal prunelle), potassium sulphate, potassium bitartrate (cream of tartar, argols), liver of sulphur (an impure potassium sulphid), and lime; 2d. **Zinc, silver, etc.,** Zinc sulphate (white vitriol), zinc chlorid, silver nitrate (lunar caustic), tin chlorides, bismuth subnitrate, potassium bichromate, iron sulphate (green vitriol, copperas), and ferric chlorid; 3d. Such **"simple vegetable irritants"** as "aloes, colocynth, jalap, gamboge, scammony, elaterium, croton oil, castor-oil seeds, various specifics of arum, euphorbium, bryony, mezereon, physic nut, and others less commonly

known;" and also such "**simple animal irritants**" as poisonous fish, and poisonous meat, and such foods as milk and cheese which have undergone such changes as make them poisonous; 4th. Such "**irritant gases**" as chlorin, sulphurous acid, nitric oxid, hydrochloric acid gas, and ammonium hydroxid.

Under his third group, "**Specific Irritants**," he places, 1st. Such "**specific mineral irritants**" as iodin and potassium iodid, bromin and potassium bromid; also phosphorus, arsenous acid (arsenic, white arsenic), hydrogen arsenid, copper arsenite (Scheele's, Brunswick, or mineral green), antimony chlorid (terchlorid or butter of antimony), tartar emetic (tartarized antimony, potassium-antimony tartrate), mercury and its compounds, such as corrosive sublimate, calomel, the red oxid (red precipitate), the red sulphid (cinabar or vermilion), the cyanid, the nitrates, and the subsulphate (turpeth mineral); also lead acetate (sugar of lead), lead subacetate (Goulard's extract), lead carbonate (white lead), copper sulphate (blue vitriol or bluestone), copper subacetate (verdigris), barium chlorid, barium nitrate, and barium acetate. 2d. Such "**specific vegetable irritants**" as laburnum, "cenanthe crocata, phellandrinum aquaticum, æthusa, cynapium, etc." Also black hellebore. 3d. Such "**specific animal irritants**" as cantharides (Spanish flies), etc.

His fourth group, "**Neurotics**," he divides into "**Narcotics** (neurotics acting on the brain and producing sleep)," in which he includes opium and its various preparations and alkaloids; "**Anesthetics** (neurotics acting on the brain and producing loss of sensation)," in which he includes chloroform, chloral, methylene dichlorid, ether, and nitrous oxid; "**Inebriants** (neurotics acting on the brain and producing intoxication)," in which he includes alcohol, nitrobenzene, anilin, cocculus indicus, dandel seeds (*lolium temulentum*), camphor and fungi; "**Deliriant**s (neurotics acting on the brain and producing delirium),"

in which he includes belladonna and its alkaloid, stramonium (thorn apple), dhatoora (seeds of *datura alba*), henbane and its alkaloids, nightshade with its active principle solanin, cocain and eucain; "**Convulsants** (neurotics producing convulsions)," in which he includes nux vomica, strychnin and brucin; "**Paralysants** (neurotics producing paralysis of the motor nerves)," in which he includes calabar bean and its active principle eserine, conium (common or spotted hemlock) and its alkaloid conin; "**Hypostenisants or Syncopants** (neurotics producing death by syncope)," in which he includes aconite and its alkaloid aconitin, hydrogen cyanid (prussic acid), potassium cyanid, also gelsemium and its alkaloid gelsemin, etc.; "**Depressants** (neurotics producing marked depression of the heart's action)," in which he includes digitalis and its active principle digitalin, tobacco and its alkaloid nicotin, lobelia, colchicin, white hellebore and green hellebore and veratrine; "**Asphyxiants** (noxious gases, producing neurotic symptoms by means of blood poisoning)," in which he includes carbon monoxid, carbon dioxid (carbonic acid gas), hydrogen sulphid (sulphuretted hydrogen), and the so-called "coal gas;" "**Abortives** (substances producing abortion)," in which he includes ergot of rye, savin and its oil, oil of tansy, the yew, and extract of cotton root.

To the foregoing, Taylor adds the following in the appendix of his book:

I. "**Bites of venomous reptiles,**" with chief reference to the bites of such serpents as the cobra of India, the adder (or common viper) of England, the brown and black snake of Australia, also the tiger snake, the rattlesnake, the copperhead, etc.

II. "**Bites of rabid animals,**" such as mad dogs, etc.

III. "**The stings of bees, etc.,**" including those of bees, wasps, hornets, scorpion, etc.; also the bites of ants and other insects.

ROBERT'S CLASSIFICATION OF POISONS.

I. POISONS WHICH CAUSE COARSE ANATOMICAL CHANGES OF THE ORGANS.

A. Those which especially irritate the part to which they are applied.

1. Acids.
2. Caustic alkalies.
3. Caustic salts, especially those of the heavy metals.
4. Locally irritating organic substances, which neither can be classified as corrosive acids nor alkalies, nor as corrosive salts. Such are: Cantharidine, phrynine, and others in the animal kingdom, croton oil and savin in the vegetable kingdom; locally irritating colors, such as the aniline dyes.
5. Gases and vapors which cause local irritation when breathed, such as ammonia, chlorine, iodine, bromine, and sulphur dioxide.

B. Those which have but little effect locally, but change anatomically other parts of the body, such as lead, phosphorus and others.

II. BLOOD POISONS.

1. Blood poisons interfering with the circulation in a purely physical manner, such as peroxide of hydrogen, ricine, abrine.
2. Poisons which have the property of dissolving the red blood corpuscle, such as the saponins.
3. Poisons which, with or without primary solution of the red blood corpuscles, produce in the blood methæmoglobin, such as potassic chlorate, hydrazine, nitrobenzene, aniline, picric acid, carbon disulphide.
4. Poisons having a peculiar action on the coloring matter of the blood, or on its decomposition products, such as hydric sulphide, hydric cyanide, and the cyanides and carbon monoxide.

III. POISONS WHICH KILL WITHOUT THE PRODUCTION OF COARSE ANATOMICAL CHANGE.

1. Poisons affecting the cerebro-spinal system, such as chloroform, ethèr, nitrous oxide, alcohol, chloral, cocaine, atropine, morphine, nicotine, coniine, aconitine, strychnine, curarine, and others.
2. Heart poisons, such as digitalis, helleborin. muscarine.

IV. POISONOUS PRODUCTS OF TISSUE CHANGE.

1. Poisonous albumin.
2. Poisons developed in food.
3. Auto-poisoning. e.g., uræmia, glycosuria, oxaluria.
4. The more important products of tissue change, such as fatty acids, oxyacids, amido-fatty acids, amines, diamines, and ptomaines.

CLASSIFICATION OF POISONS ACCORDING TO THE MOST PROMINENT SYMPTOMS.—(Blyth.)

A. POISONS CAUSING DEATH IMMEDIATELY, OR IN A FEW MINUTES.

There are but few poisons which destroy life in a few minutes. Omitting the strong mineral acids, carbon monoxide, carbon dioxide, with the irrespirable gases, prussic acid, the cyanides, oxalic acid and occasionally strychnine are the chief poisons coming under this head.

B. IRRITANT POISONS (Symptoms Mainly Pain, Vomiting and Purging.)

Arsenic, antimony, phosphorus, cantharides, savin, ergot, digitalis, colchicum, zinc, mercury, lead, copper, silver, iron, baryta, chrome, yew, laburnum, and putrid animal substances.

C. IRRITANT AND NARCOTIC POISONS (Symptoms Those of an Irritant Nature, With the Addition of More or Less Pronounced Cerebral Indications.)

To this class more especially belong oxalic acid and the oxalates, with several poisons belonging to the purely narcotic class, but which produce occasionally irritant effects.

D. POISONS MORE ESPECIALLY AFFECTING THE NERVOUS SYSTEM.

1. Narcotics (chief symptom insensibility, which may be preceded by more or less cerebral excitement), opium, chloral, chloroform.

2. Deliriants (delirium for the most part a prominent symptom), belladonna, hyoscyamus, stramonium, with others of the solanaceæ, to which may be added poisonous fungi, Indian hemp, lolium temulentum, ænanthè, crocata, and camphor.

3. Convulsives. Almost every poison has been known to produce convulsive effects, but the only true convulsive poisons are the alkaloids of the strychnos class.

4. Complex Nervous Phenomena. Aconite, digitalis, hemlock, calabar bean, tobacco, lobelia inflata, and curara.

Analyst Blyth, of England, states his views, regarding the best classification of poisons, as follows:

"I have preferred an arrangement which, as far as possible, follows the order in which a chemical expert would search for an unknown poison, hence an arrangement partly chemical and partly symptomatic. First, the chief gases which figure in the mortality statistics are treated, and then follow in order other poisons."

A chemist given a liquid to examine would naturally test first its reaction, and, if strongly alkaline or strongly acid, would at once direct his attention to the mineral acids or to the alkalies. In other cases he would proceed to separate volatile matters from those that were fixed, lest substances such as prussic acid, chloroform, alcohol, and phosphorus be dissipated or destroyed by his subsequent operations.

Distillation over, the alkaloids, glucosides, and their allies would next be naturally sought, since they can be extracted by alcoholic and ethereal solvents in such a manner as in no way to interfere with an after-search for metals.

The metals are last in the list, because by suitable treatment, after all organic substances are destroyed, either by actual fire or powerful chemical agencies, even the volatile metals may be recovered. The metals are arranged very nearly in the same order as that in which they would be separated from a solution, viz., according to their behavior to hydric and ammoniac sulphides.

There are a few poisons, of course, such as the oxalates of the alkalies, which might be overlooked, unless sought for specially, but it is hoped that this is no valid objection to the arrangement suggested, which, in greater detail, is as follows:

A. POISONOUS GASES.

Carbon monoxide.

Chlorine.

Hydric sulphide.

B. ACIDS AND ALKALIES.

1. Sulphuric acid.

2. Hydrochloric acid.

3. Nitric acid.

4. Potash.

5. Soda.

6. Ammonia.

7. Neutral sodium, potassium, and ammonium salts.

In nearly all cases of death from any of the above, the analyst, from the symptoms observed during life, from the surrounding circumstances, and from the pathological appearances and evident chemical reactions of the fluids submitted, is put at once on the right track, and has no difficulty in obtaining decided results.

C. POISONOUS SUBSTANCES CAPABLE OF BEING SEPARATED BY DISTILLATION FROM EITHER NEUTRAL OR ACID LIQUIDS.

1. Hydrocarbons.
2. Camphor.
3. Alcohols.
4. Amyl-nitrite.
5. Chloroform and other anæsthetics.
6. Carbon disulphide.
7. Carbolic acid.
8. Nitro-benzene.
9. Prussic acid.
10. Phosphorus.

The volatile alkaloids, which may also be readily distilled by strongly alkalizing the fluid, because they admit of a rather different mode of treatment, are not included in this class.

D. ALKALOIDS AND POISONOUS VEGETABLES PRINCIPLES SEPARATED FOR THE MOST PART BY ALCOHOLIC SOLVENTS.

Division I.—Vegetable Alkaloids.

1. Liquid volatile, alkaloids, alkaloids of hemlock, nicotine, pituric, sparteine, aniline.
2. The opium group of alkaloids.
3. The strychnine or tetanic group of alkaloids, strychnine, brucine, igasurine.
4. The aconite group of alkaloids.
5. The mydriatic group of alkaloids, atropine, hyoscyamine, solanin, cytisine.
6. The alkaloids of the veratrines.
7. Physostigmine.
8. Pilocarpine.
9. Taxine.
10. Curarine.
11. Colchicin.
12. Muscarine and the active principles of certain fungi.

There would, perhaps, have been an advantage in arranging several of the individual members somewhat differently, e.g., a group might be made of poisons which, like pilocarpine and muscarine, are antagonistic to atropine; and another group

suggests itself, the physiological action of which is the opposite of the strychnos class. Solanin (although classed as a mydriatic and put near to atropine), has much of the nature of a glucoside, and the same may be said of colchicin, so that, if the classification were made solely on chemical grounds, solanin would have followed colchicin, and thus have marked the transition from the alkaloids to the glucosides.

Division II.—Glucosides.

1. The digitalis group.
2. Other poisonous glucosides acting on the heart.
3. Saponin.

The glucosides, when fairly pure, are easily recognized; they are destitute of nitrogen, neutral in reaction, and split up into sugar and other compounds when submitted to the action of saponifying agents, such as boiling with dilute mineral acids.

Division III.—Certain Poisonous Anhydrides of the Organic Acids.

1. Santonin.
2. Mezerein.

It is probable that this class will in a few years be extended, for several other organic anitrogenous poisons exist, which, when better known, will most likely prove to be anhydrides.

Division IV.—Various Vegetable Poisonous Principles Not Admitting of Classification Under the Previous Three Divisions.

Ergot, picrotoxin, the poison of *illicium religiosum*, cicutoxin, *æthusa cynapium*, *œnanthe crocata*, croton oil, savin oil, the toxalbumins of castor oil, and abrus.

The above division groups together various miscellaneous toxic principles, none of which can at present be satisfactorily classified.

E. POISONS DERIVED FROM LIVING OR DEAD ANIMAL SUBSTANCES.

Division I.—Poisons Secreted by the Living.

1. Poisonous amphibia.
2. Poison of the scorpion.
3. Poisonous fish.
4. Poisonous insects, spiders, wasps, bees, beetles, etc.
5. Snake poison.

Division II.—Poisons Formed in Dead Animal Matters.

1. Ptomaines.
2. Poisoning by putrid or changed foods—sausage poisoning.

F. THE OXALIC ACID GROUP.

G. INORGANIC POISONS.

Division I.—Precipitated from a hydrochloric acid solution by hydric sulphide-precipitate, yellow or orange.

Arsenic, antimony, cadmium.

Division II.—Precipitated by hydric sulphide in hydrochloric acid solution-black.

Lead, copper, bismuth, silver, mercury.

Division III.—Precipitated from a neutral solution by hydric sulphide.

Zinc, nickel, cobalt.

Division IV.—Precipitated by ammonia sulphide.

Iron, chromium, thallium, aluminium.

Division V.—Alkaline earths.

Barium.

THE FATAL DOSE OF A POISON.

It is very difficult to declare positively the exact fatal dose of any particular poison. Age of person, condition of stomach as regards food, early and free vomiting, tolerance of that particular poison from habit or otherwise, etc., all more or less influence the effect and result.

Even in some authenticated cases, the exact quantity is unknown, and in others the strength of the preparation used is not stated.

Some poisons are exceedingly active or deadly in very small doses. Among these are Aconitine gr. $\frac{1}{10}$; Digitaline gr. $\frac{1}{4}$; Hydrocyanic Acid gr. 1; Strychnine gr. $\frac{1}{2}$; etc., also some animal poisons, such as the venom of certain snakes, the bite of the tarantula, etc. Some of the toxins are exceedingly poisonous. The toxin of diphtheria is so poisonous that, it is said, so small a quantity of it as one four-millionth of the body-weight will produce death.

PROMPT TREATMENT FOR POISONING.

When symptoms and circumstances indicate that a poison has been taken, the following course should be pursued:

1. If there is a known chemical antidote and it is at hand, use it at once (either alone or in conjunction with an evacuant), and in sufficient quantity to thoroughly neutralize the poison.

If the chemical antidote is not known or not at hand and it is believed no corrosive poison strong enough to produce a prohibitive caustic effect, has been taken, or the patient is not in a condition of extreme exhaustion, at once evacuate the stomach (i. e., resort to 2). Or where evacuation is impossible or improper, promptly employ such mechanical antidotes as will coat the walls of the stomach, etc., mechanically suspend the poison, or remove the latter by catharsis.

2. In absence of prohibitive caustic action of poison, inflammation, or extreme exhaustion, evacuate and wash out stomach by means of stomach-tube, stomach pump, or emetics, and warm water. If a chemical antidote is now for the first time convenient, employ it. Demulcents should usually be employed after evacuation of stomach.

3. Use the proper antagonist to counteract the effects of any of the poison which may have been absorbed. (If the patient is not treated promptly after the poisoning, it may be advisable to at once resort to the physiological antidote (antagonist).)

Also encourage the natural processes of removal (i. e., urination, perspiration, etc.).

4. Employ the proper antagonistic measures to stimulate flagging organic functions.

ANTIDOTES.

Antidotes directly affect a poison either mechanically or chemically, or both, so as to remove it from the body, alter its character before absorption, or

hinder absorption, and thus prevent its poisonous action upon the system. They act in the respiratory passages or alimentary canal and may be employed for vegetable, animal or mineral poisons.

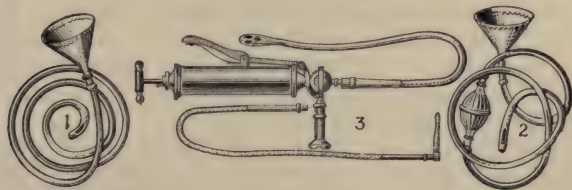
Mechanical Antidotes include: use of stomach tube or pump; employment of Emetics, Cathartics, Demulcents, Injections, Ligatures, Poultices, Washes, etc.

Chemical Antidotes include: Oils, Soap, Milk, Acids, Albumin, Alkalies, Charcoal, Carbonates, Hydrates, Sulphates, Iodine, Potassium, Permanganate, Sodium Chloride, Starch, Tannic Acid, Turpentine, preparations of Iron, etc.

MECHANICAL ANTIDOTES.

THE STOMACH TUBE AND THE STOMACH PUMP.

When active measures are to be employed to evacuate the stomach, this is most readily accomplished by means of the stomach tube (Figs. 1 and 2), the stomach pump (Fig. 3), or by emetics.



The **stomach tube** (with or without an exhaust bulb) is introduced into the stomach by forcibly keeping the poisoned person's mouth open, by means of a gag or of a knife handle wrapped in a handkerchief, and passing the tube down; the finger should be used to guide it in the mouth. Care should be exercised that the tube is not accidentally passed into the windpipe in front of the gullet. It is sometimes found necessary to introduce the tube through the nose instead of the mouth. Tepid water may be introduced into the stomach through the funnel and tube, and by lowering the tube and

turning the funnel down, the stomach may be more or less emptied of fluid and poison by siphonage, or by using the exhaust bulb.

Washing out process should be repeated until all poison apparently has been removed from stomach.

The proper antidote or emetic may frequently advantageously be dissolved in the water used.

The stomach pump is a harsher, but sometimes more effective apparatus than the stomach tube.

Although the stomach pump and stomach tube are so efficient and do not weaken the person as emetics do, yet neither should be used when there is severe corrosion of the stomach or esophagus, lest perforation result. Both may be difficult to use or inefficient when the poison is in a solid form (as meat, fish, etc.).

EMETICS.

Emetics are agents which produce vomiting. They may conveniently be divided into two classes: **Local Emetics**, and **Systemic or General Emetics**.

Local Emetics produce their effects by their irritation of the terminal nerve filaments of the pharynx, esophagus or stomach. The emetic action results from a reflex stimulation of the vomiting center in the medulla oblongata.

Systemic or General Emetics produce their effects through the medium of the circulation. The emetic action is due to a direct stimulation and irritation of the vomiting center in the medulla.

LOCAL EMETICS.

Alum—a tablespoonful in water, syrup or honey. (Unreliable.)

Ammonium Carbonate—30 grs. or more in water.

Copper Sulphate—10 grains in water in one dose; or 3 to 6 grains in water every 15 minutes until it acts.

Mustard—2 to 4 teaspoonfuls in a cupful of warm water, stirred to a cream. (Good and stimulating).

Olive Oil, Melted Fats, Soapsuds, Vaseline, etc.
—freely.

(Fats and Oils and substances containing them are contra-indicated in poisoning by Cantharides, Carbolic Acid, Copper Salts, or Phosphorus, because fats and oils facilitate the absorption of these poisons.)

Quassia and other vegetable bitters—in strong infusion as a drink.

Sodium Chloride—(common salt) 2 teaspoonfuls or more in a cupful of water. (Frequently effective).

(Sodium Chloride is contra-indicated in poisoning by Tartar Emetic, or Mercuric Chloride. Also do not give it after Zinc Sulphate.)

Tepid Water—in quantity freely, (4 to 8 glasses).

Tickling Throat with feather or finger. (Good).

Yellow Mercuric Sulphate (Turpeth Mineral)—2 to 5 grains. (Unsafe unless it vomits.)

Zinc Sulphate—10 to 30 grains in a wineglassful of water; repeat if necessary. Or 30 grains in 2 ounces of water, giving a tablespoonful every 10 to 20 minutes until effective. Children 5 grains. (This is the best emetic.) It is prompt and safe, but do not give it after giving salt and water.

SYSTEMATIC OR GENERAL EMETICS.

Antimony, Wine of—An ounce or more in water.

Apomorphine Hydrochlorate—gr. $\frac{1}{16}$ to $\frac{1}{8}$, hypodermically when the use of emetics by the mouth is prevented by narcosis or otherwise.

Emetine—gr. $\frac{1}{12}$ to $\frac{1}{3}$.

Ipecac, Fluid Extract of— $\frac{1}{4}$ to 1 teaspoonful.

Ipecacuanha, Pulverized—15 to 30 grains or more in water, repeated in 10 or 15 minutes. Does not irritate the mucous membrane of the stomach.

Ipecac, Syrup of—1 to 4 teaspoonfuls, or a teaspoonful every 10 minutes until vomiting is produced.

Ipecac, Wine of—1 or 2 tablespoonfuls in water. (Slow and unsatisfactory).

Squill, Syrup of—A teaspoonful.

Squill, Compound Syrup of— $\frac{1}{4}$ to $\frac{1}{2}$ teaspoonful.

Tartar Emetic—1 to 3 grains. Children $\frac{1}{2}$ grain.
(Slow and depressing).

In poisoning it is better to use almost any emetic at once than to lose valuable time getting just the right emetic. Some persons vomit very readily, others with the greatest of difficulty. Some vomit from a drink of tepid, greasy or dirty water, with or without the introduction of the fingers into the throat. In narcotic poisoning it is frequently very difficult to induce vomiting. It is sometimes desirable to give a combined emetic. May begin with a tablespoonful of mustard in a small tumblerful of water and follow soon after with Zinc Sulphate 30 grains, and powdered Ipecacuanha 30 grains, mixed in water.

The action of an emetic is aided by giving plenty of tepid water. Emetics are contra-indicated when there is a severe corrosion of the alimentary canal or an abdominal inflammation.

CATHARTICS.

Cathartics are agents which produce intestinal evacuations. They include Castor Oil, Croton Oil, Magnesium Sulphate, Senna, Sodium Phosphate, etc. They are generally used after a chemical antidote to remove from the intestinal canal the compounds formed by such antidote.

Castor Oil protects the mucous membrane and interferes with absorption, but should not be used in poisoning by Cantharides, Carbolic Acid, Copper Salts or Phosphorus, absorption of which it seems to aid.

Croton Oil is rapid and active in a 1 to 5 minim dose in bread pill.

Magnesium Sulphate is useful in doses of $\frac{1}{2}$ to 4 ounces, in water. Sodium Sulphate in same doses.

Such cathartics as **Senna** and **Gamboge** are often the best ones for narcotic poisoning.

DEMULCENTS.

Demulcents are substances which soothe and protect the parts to which they are applied. They include Almond, Olive, and other bland Oils, Acacia, Barley, Cetraria, Elm, Figs, Flaxseed, Gelatin, Glycerine, Honey, Isinglass, Liquorice Root, Marsh-mallow Root, Starch, Tragacanth, and White of Egg, each with or without water.

CHEMICAL ANTIDOTES.**OILS, ALBUMIN, TANNIN, ETC.**

Oils and Fats (almond, cotton seed, linseed and olive oils, melted butter, lard, etc.). Oils and fats are useful against the corrosive acids and alkalies, metallic oxides and salts; they are, however, considered to be contra-indicated in poisoning by Cantharis, Carbolic Acid, Creosote, Copper Salts and Phosphorus, because they encourage the absorption of these poisons. Oils and fats unite with the caustic alkalies to form soaps; thus liberating glycerine. As antidotes to the metallic salts they are not as good as albumin. As antidotes to the alkalies they are inferior to acids, owing to their slow action.

Soap (Castile Soap, etc.). Castile soap dissolved in four times its bulk of hot water to form "suds," and administered by the cupful, is an excellent antidote for corrosive acids and metallic salts, particularly Corrosive Sublimate, Potassium Bichromate, and Tin and Zinc Salts; but Albumin is better for these last two. Soap is better than caustic alkalies for acids, because it has no corrosive action. It should not be used as an antidote to alkalies.

Albumin.—An excellent **Chemical Antidote**, forming **Compounds**, more or less inert with most of the corrosive alkalies, metallic salts, mineral acids, Anilin, Bromine, Chlorine, Creosote, Iodine, and with alcoholic solutions of most of the alkaloids.

It is particularly valuable as an antidote to **inorganic** poisons and a good application for the bites and stings of insects.

Albumin should be well diluted when used (the whites of four eggs to one quart of tepid water). It is important to follow it first by an emetic and then by a cathartic, inasmuch as many of its compounds are soluble in an excess of albumin, or in acid or alkaline solutions.

Milk.—The antidotal action of milk is similar to that of albumin and due to its albumin, casein and free alkali. Milk is a good substitute for albumin, and especially suitable for metallic salts, corrosive acids and alkalies (particularly Ammonia), and the alkaline earths. Owing to the fat in milk it is to be avoided when fatty antidotes are contra-indicated, except in poisoning by Phenol.

White of egg and milk together are good antidotes to iodic preparations and Phenol.

Acids, Inorganic.—Diluted Sulphuric Acid $\frac{1}{2}$ drachm mixed in water is used as an antidote to the soluble salts of Barium and Lead, forming insoluble Sulphates. It is also used to prevent absorption of lead in Lead Poisoning.

Acids, Organic.—Acetic Acid (such as vinegar), Citric Acid (such as lemon, lime, or orange juice), and Tartaric Acid in water are used as antidotes to the alkalies and the alkaline carbonates.

Ammonia (diluted), by inhalation, is an excellent antidote to the vapors of corrosive acids and Nitrobenzol, Formaldehyde, and to Bromine, Chlorine, and Hydrocyanic Acid, also to relieve the stupor of alcoholic poisoning.

Ammonium Carbonate, by hypodermic injection (in 5 grain doses in aqueous solution), in the vicinity of a wound through which arrow poison has entered the body, is very efficient against such poison. Locally applied it is also very efficient in the bites of venomous serpents and insects. Taken internally it is capable of promptly suspending a high degree of alcoholism. Calcium Hydrate and

Carbonate (Lime Water, powdered chalk mixed with water (*Mistura Cretae*), egg shells, pulverized oyster shells, etc.) may advantageously be employed as an antidote to neutralize Oxalic Acid and the Acid Oxalates and convert them into insoluble Calcium Oxalate.

Charcoal (powdered) has an antidotal action against many alkaloids, metallic salts and Phosphorus, and apparently against Opium, *Nux Vomica*, and Aconite, delaying the poisonous action and effects of all of them. It may either absorb the poison or protect the walls of the stomach. It absorbs gases but does not form a fixed compound with any mineral or vegetable poison. **Fresh Animal Charcoal** is preferable to wood charcoal, and is used in **tablespoonful doses**, frequently repeated. It should be followed by an emetic or the stomach-tube.

Alcohol.—Concentrated alcohol has a dehydrating effect upon animal tissues with which it comes in contact. It is considered a valuable antidote in Carbolic Acid poisoning. Four ounces of Alcohol in as much or more water may be administered repeatedly, each time removing it by means of the stomach-tube; or Apomorphine may be given hypodermically, to empty the stomach, and to prevent acute alcoholism. **Magnesium Sulphate** or **Sodium Sulphate** in 1 to 2 ounce doses in water should then be given. A half pint or more of brandy or whiskey may be substituted for the alcohol and water. Although alcohol is so applicable to serpent poisoning it is not a direct antidote to it. As a heart stimulant in certain kinds of poisoning alcohol is invaluable, but should be avoided in case of injury to the brain, or excessive cardiac action.

Ether has been extensively employed as a stimulant, in the collapse of Opium and Chloral poisoning, in fifteen minim doses hypodermically injected (not deeply) and repeated as often as necessary.

Chlorine, employed externally in the form of Chlorine Water, Labarraques' Solution (a solution of Sodium Hypochlorite), or Javelle Water (a solution of Potassium Hypochlorite), is a good antidotal

wash for snake-bite, insect stings, and other poisoned wounds; it may be employed internally when well diluted, as an antidote to alkaloids and other vegetable and animal poisons; may also be inhaled as a spray, as an antidote against coal gas (Carbonic Oxide), Ammonia, Phosphoretted and Sulphuretted Hydrogen, and Hydrocyanic Acid. Sodium Hyposulphite is the antidote to the Chlorine and Iodine solutions.

Copper Sulphate, as an emetic, may be given in doses of three or four grains or more in water, until vomiting occurs. It is more irritating than Zinc Sulphate and hence acts more readily. If it fails to act it must be promptly removed (by stomach tube or otherwise) or it will cause local inflammation. In Phosphorus poisoning Copper Sulphate is of special application, as it is supposed to coat the particles of Phosphorus, primarily with a layer of Copper Phosphide, secondarily with Copper itself, thus preventing the solution of the Phosphorus particles in the stomach fluids.

Gelatin is an antidote to the Alums, Bromine, and Iodine. The chief objection to it is that it has to be broken up, soaked in water half an hour and reduced to a fine consistency. It has a soothing effect upon irritated mucous membranes.

Gluten is sometimes employed as an antidote to Corrosive Sublimate, but it is not readily procured nor as efficient as Albumin.

Gum Arabic in the form of mucilage is chiefly serviceable as a protective in the alimentary canal, against irritant or corrosive poisons. It is also used as an antidote to the Bismuth salts.

Iodine, well diluted, is sometimes given as an antidote to the alkaloids and their salts, to other vegetable poisons and to snake venom. It is one of the most reliable applications to wounds made by venomous serpents and rabid animals. All Iodine compounds are more or less soluble and poisonous and must on this account be promptly removed from

the system. The following antidote (Bouchardat's) for vegetable poisons is considered very good:

Iodine, 3 grains; Potassium Iodine, 30 grains; Distilled Water, 11 ounces; mix. Dose, $1\frac{1}{2}$ to 3 ounces, frequently repeated.

Iron—Ferri Oxidum Hydratum (Hydrated Ferric Oxide), also Ferri Oxidum Hydratum cum Magnesia (the Official Arsenic Antidote), Ferrum Oxidatum Saccharatum, Dialyzed Iron and the basic Ferric Acetate are all employed as antidotes to Arsenic poisoning. (See Arsenic, page 98).

The union of Iron with the salts of Arsenic is limited, even though the Iron be in great excess. A better action is obtained if a small amount of Ammonia or other caustic alkali is added to it, or if the basic Ferric Acetate is mixed with it.

Ferri Oxidum Hydratum—Ferric Hydroxide (Hydrate), Hydrated Oxide of Iron—is a chemical antidote for **Arsenous Acid** and the **Arsenites** with which it combines to form a ferric arsenite and also acts locally as a protector of the mucous membrane of the alimentary canal. It is a reddish-brown, smooth magma, entirely soluble, without effervescence, in Acetic Acid. When required for use it should be freshly prepared by mixing together Solution of Ferric Sulphate 100 parts, Ammonia Water 110 parts, and water enough to make 250 parts. The solution of Ferric Sulphate and the Ammonia Water should be kept on hand in separate bottles all ready for mixing, 200 Cc. of the first and 220 Cc. of the latter. When mixed together in these proportions a precipitate forms which may be washed by pressing it in a wet muslin strainer until no more liquid passes, then suspending it in 250 parts of water. The dose is a teaspoonful in water, repeated every 5 or 10 minutes.*

*Although such is in accordance with the U. S. P. direction, it would seem desirable and more convenient for the solutions to be made of such strength that a mixture of equal volumes of them would cause them to neutralize each other.

Ferri Oxidum Hydratum cum Magnesia (Ferric Hydrate with Magnesia, Arsenic Antidote), dose, a teaspoonful in water, repeated every 5 or 10 minutes, is a more convenient and better arsenic antidote than the preceding preparation. In this the excess of the alkaline precipitant is not an irritant and is itself an antidote to Arsenic.

The following solutions (1 and 2) should be kept on hand:

No. 1. Solution of Ferric Sulphate 50 cc., in water 100 cc.

No. 2. Magnesia (Magnesium Oxide), 10 grammes, rubbed up with water 750 cc., in a bottle of 1000 cc. capacity. When the preparation is required, shake No. 2 to a homogeneous magma and add it gradually to No. 1, after which shake them together to a uniform smooth mixture. This should be given in large doses of an ounce or more, and frequently repeated.

Sesqui-Oxide of Iron (freshly prepared), made by precipitating Tincture of Perchloride of Iron with Sodium Carbonate and filtering through a cloth, may be given as an antidote to Arsenic. It should be freely administered in hot water.

Dialyzed Iron may be given in ounce doses or less, frequently repeated, for the same purpose.

Magnesia (Calcined Magnesia; Magnesium Oxide; Mg. O.). Magnesia mixed with twenty-five times its weight of warm water gelatinizes, becoming suited to antidotal use. It may be given in $1\frac{1}{2}$ to 2 ounce doses of such mixture, frequently at first, then after a few doses less often. An excess merely acts as a cathartic. Magnesium Oxide is better than Magnesium Carbonate as an antidote to the acids, because of the production of Carbon Dioxide, which might injure the stomach by its expansive action. Magnesia is one of the best antidotes against the acids and the acid salts, including even Oxalic Acid, and the Acid Oxalates, if the Calcium antidotes are not at hand. It is

also a good antidote in poisoning by Arsenic, Phosphorus, Mercury, Corrosive Sublimate, and other metallic salts. With most of these it forms insoluble compounds; with the mineral acids its value is chiefly due to its power to neutralize them; by alkalinizing the stomach contents it hinders the absorption of alkaloids.

Magnesium Sulphate (Epsom Salt), and **Sodium Sulphate** (Glauber Salt) are soluble Sulphates and especially efficient in poisoning by Carbolic Acid or by the salts of Barium or of Lead. With the last two they form insoluble Sulphates. With Carbolic Acid they apparently do not form a Sulpho-carbolate of Magnesium or of Sodium in the stomach, but encourage elimination of the Carbolic Acid after it has been absorbed. Sodium Sulphate seems to be superior to Magnesium Sulphate as an eliminative in poisoning by Carbolic Acid. These salts should be administered in $\frac{1}{2}$ to 2 ounce (or 1 to 2 tablespoonful) doses in water, repeated at frequent intervals, and a pint or more of a solution one-fourth that strength should be left in the stomach, after repeated lavage, to be absorbed and wholly neutralize the absorbed Carbolic Acid. Carbolic Acid appears in the urine as Potass-Phenyl-Sulphate, not as a Sulpho-Carbolate, and when no soluble sulphate has been given.

Potassium Ferrocyanide is efficient as an antidote to the Copper salts, and may be given in 30 to 60 grain doses in water. Albumin, however, is just as good and as a rule more convenient, and safer.

Potassium Permanganate.—If Potassium Permanganate be administered promptly, before absorption of the poison has taken place, it is the best antidote to all organic poisons, inasmuch as it rapidly destroys them by oxidation. It has been claimed that this result is secured not only when the Permanganate encounters the poison by direct contact with it in the stomach, but also after both poison and anti-

dote have been absorbed into the circulation; but the latter claim has not been satisfactorily substantiated. **Potassium Permanganate** is particularly applicable to **Eserine** (Physostigmine), **Opium**, **Phosphorus**, **Morphine**, and **Strychnine** salts, in the stomach. As an antidote to organic poisons in general, it should be given in 3 to 4 grain doses in about 4 ounces of water, every half hour until four or more doses have been taken. As an antidote to **Morphine** or its salts, 10 to 15 grains may be dissolved in $\frac{1}{2}$ to 1 pint of water and given. It is common to repeat the dose every half hour until three or four doses have been taken. When the poisoning is by **Laudanum** a few drops of **Dilute Sulphuric Acid** or two teaspoonfuls of **Dilute Acetic Acid** or white vinegar should be added to the antidote. **Potassium Permanganate** is promptly decomposed by **Alcohol**, and by the usual stomach contents, urine, etc. Locally, this antidote is good in snake poison, in a one per cent. solution, by hypodermic injection about the wound, if applied promptly before absorption of the venom.

Potassium Bicarbonate and the **Carbonate**, **Sodium Bicarbonate** and the **Carbonate**, may be used as antidotes to most of the poisonous metallic salts, particularly those of **Zinc**, which they immediately decompose, forming insoluble basic compounds. They are also used against **Bromine**, **Iodine**, and **Potassium Bichromate**. They form the neutral **Chromate** with **Potassium Bichromate** and harmless salts with **Iodine**. They may be used in dilute solutions against non-concentrated acids, but should not be used against the concentrated mineral acids, as they generate large volumes of **Carbon Dioxide** which might distend and rupture the eroded stomach. **Chalk** is inapplicable for the same reason.

No alkaline **Carbonates** or **Bicarbonates** should be administered in poisoning by **Oxalic Acid**, as

the resulting oxalates are soluble and almost as poisonous as the Acid itself.

Potassium Iodide is administered in 5 to 30 grain doses three times a day in chronic poisoning by Arsenic, Mercury, or Lead, or their salts, to encourage their elimination from the system.

Sodium Chloride (common salt) is the best antidote against the silver salts, as it converts them into the insoluble Chloride of Silver. It should be given in dilute solution and may be combined with albumin, which is also good for the same purpose. A strong salt solution is employed as an antidote to the stings and bites of insects.

Two teaspoonfuls of salt in water frequently serves as an efficient emetic.

Sodium Hyposulphite (Sodium Thiosulphate) is an efficient antidote for Iodine, Potassium Iodide, Bleaching Powder (Calcium Hypochlorite), Labarraque's Solution, and Javelle Water reducing them to chlorides and itself oxidizing into the Sulphate.

Starch, made into paste by mixing one part of Starch with fifteen parts of hot water gradually added, is the antidote for Iodine and Bromine, producing compounds which are almost harmless. It has a slight antidotal action against corrosive acids, Corrosive Sublimate, Copper Sulphate, and Zinc Sulphate. **Wheaten flour** is also a good antidote to the foregoing. **Cooked Starch** is more efficient than the raw Starch, but the delay necessary to procure the former is not warranted by the degree of superiority over the latter. In poisoning by Iodine preparations, free vomiting or lavage should be encouraged as long as the rejected liquid tinges blue a solution of Starch. The blue color which Starch strikes with Iodine offers the surest test for the presence of Iodine in the urine and other secretions of the body, after the Iodine has been set free by Chlorine Water and Nitric Acid.

Iodide of Starch has been employed as an antidote to poisons in general, and in poisoning by the salts

of Lead or Mercury it is thought to aid their elimination. It is not an irritant and can be given in large doses but must be removed from the alimentary canal by emetics and cathartics.

Acid Tannic (Tannin) precipitates and forms Tannates with the alkaloids and their salts; the Tannates are nearly insoluble, but not absolutely inactive, being somewhat soluble in dilute hydrochloric acid of the gastric juice, also readily soluble in dilute alcohol, and emetics and active purgatives should be employed for their prompt removal from the alimentary canal. Tannin renders Tartar Emetic harmless (but albumin does not) by forming an insoluble Tannate of Antimony. Tannin should be given in doses of 20 grains in a coffee-cupful of water or as much as 45 grains in a pint of water every fifteen minutes. By combining about ten per cent. of its weight of Iodine with it, its efficacy as an antidote to vegetable poisons is increased, but not over ten grains of such mixture should then be given. When Tannin is not at hand, resort may be had to decoctions or infusions of Tea, Coffee, Nut-galls, Kino, Rhatany, Catechu, Oak, Willow or Cinchona barks, or other substances which contain Tannin.

Turpentine, Oil of.—Old, crude, resinified, and French Oil of Turpentine are antidotes against poisoning by Phosphorus, forming an almost insoluble mass with it—the so-called Turpentine-Phosphoric Acid. The fresh, ordinary Oil of Turpentine is of doubtful value as an antidote to Phosphorus poisoning, but Oil of Turpentine which has long been exposed to the air and hence contains much oxygen is a very good antidote. One hundred times as much Oil of Turpentine should be given as there was Phosphorus taken, and it should be given in hot water or alone (floated on the water or in capsules) immediately after the Phosphorus is taken, or as soon thereafter as possible. The antidote is considered valueless if not given within twelve hours. Do not give it with an

oil, soup, milk, white of egg or other albuminous substance; nor should mucilaginous or alcoholic drinks be allowed with it; nothing but the capsule or hot water. If it cannot be determined what quantity of Phosphorus has been taken, the Oil of Turpentine may be given in four doses of $\frac{1}{2}$ drachm (2 cc.) each, at 15 minute intervals. If the stomach will not retain the Turpentine it has been recommended to inject it into the rectum, atomize it into the lungs, saturate the air of the room with its fumes, or rub it into the skin in the form of a liniment. The acid, French Oil of Turpentine, forms a crystalline, spermaceti-like mass with the Phosphorus, and although an efficient antidote is soluble in Ether and Alcohol.

Water may be given as an emetic, used tepid and in large quantities. **Washing out the stomach by means of the stomach tube is now resorted to in nearly all cases of poisoning.** It should, however, be remembered that in **Sulphuric Acid poisoning the introduction of water, unless very copiously, is inadvisable,** at least when much of the acid has been taken, as severe heat is evolved. **In Oxalic Acid poisoning it is contra-indicated** if it is possible the poison may have been taken **in the solid form,** as solution and absorption of the poison is favored by water. Inasmuch as emetics are usually administered in water, it may be remarked in this connection that otherwise an **emetic may be given** in poisoning by Oxalic Acid, if vomiting did not occur spontaneously, and the symptoms of corrosion have not been marked. **In all cases in which a large dose of a concentrated corrosive poison has been taken, the stomach pump should not be employed.**

GENERAL ANTIDOTES WHEN THE NATURE OF THE POISON IS UNKNOWN.

When the nature of the poison is unknown the following is a good and harmless antidote to most poisons, but of little or no value in poisoning by Antimony, caustic alkalies or Phosphorus:

Equal parts of Magnesia, Charcoal (Wood), and the Hydrated Oxide of Iron, mixed and freely given in plenty of water. Two ounces of each to 12 ounces of water recommended by Jeannel. (The Magnesia is given to neutralize any acid that may be present. The Charcoal to precipitate or absorb any alkaloid. The Hydrated Oxide of Iron to combine with any arsenical compound). On a similar basis, the following may be given: Magnesia, 1 tablespoonful; Tannic Acid, 1 tablespoonful; Charcoal, 2 tablespoonfuls. Mix and give 1 teaspoonful, stirred in water, every 5 to 15 minutes. Evacuate stomach soon after using this antidote.

The following antidotal preparation delays the action of the salts of Copper, Morphine, and Strychnine. It has also some effect on compounds of Mercury. It is a perfect antidote to Arsenic, Digitalin, Zinc, etc., but it is of no value against Mercuric Cyanide, Hydrocyanic Acid, the caustic alkalies, Tartar Emetic, or Phosphorus. The preparation is as follows:

Liquor Ferri Sulphatis (specific gravity 1.45) $2\frac{1}{2}$ ounces kept in one bottle, Magnesia Calcinata 2 ounces, Carbo Animalis 1 ounce, Aqua 20 ounces, mixed and kept in another bottle. When this antidote is required, the contents of the first bottle should be poured into the second bottle and the mixture thoroughly shaken. The dose of the mixture is $1\frac{1}{2}$ to 3 ounces.

Reference must here again be made to Bouchardat's antidote for vegetable poisons, consisting of: Iodine, 3 grains; Potassium Iodide, 30 grains; Distilled Water, 11 ounces; mixed together. The dose is $1\frac{1}{2}$ to 3 ounces, frequently repeated.

PART II.

POISONS AND ACUTE POISONING: HISTORY, SYMPTOMS AND TREATMENT.

N. B.—It is to be understood that the doses in this chapter are for adults, and are to be modified according to the urgency of the symptoms, and discontinued or reduced when the symptoms are relieved.

The author has endeavored to place together poisons exhibiting similar phenomena or for which the same treatment is applicable.

The **symptoms** of those poisons which, in the opinion of the author, even the **pharmacist** should be familiar with, are in bold face type. The principal procedures in treatment are in the same type.

The resort to oxygen inhalations and to artificial respiration is always justifiable, and the neglect to do so may be censurable.

ACETANILID (ANTIFEBRIN) — ANILIN — ANTIPYRINE — EXALGIN — PHE- NACETIN.

HISTORY:

All of these drugs are more or less dangerous. Probably Acetanilid and Antipyrine the most unsafe.

Fatal dose: Death has resulted from 5 grains of Acetanilid, and a recovery from poisoning by 340 grains of it. 30 grains of Phenacetin has caused death. 3 ounces of marking ink, consisting mainly

of Anilin, has caused death within 12 hours. Anilin is an oily fluid having a peculiar and distinctive odor. The fatal dose of Anilin is considered to be about 6 grammes, but recovery has occurred after 10 grammes. Poisoning has resulted from 7 grains of Antipyrine; also from $3\frac{1}{2}$ grains; recovery has occurred from an ounce after 14 hours' unconsciousness. A Vienna report in 1890 attributes 17 deaths to this drug, by arrest of the heart.

Death from these poisons is the result of cardiac depression.

SYMPTOMS:

More or less sweating, depression, cyanosis, and collapse.

[In Acetanilid poisoning, hemoglobin and hematin are found in the urine. Symptoms of poisoning by Exalgin sometimes resemble those of angina pectoris or those of Carbolic Acid, with dyspnoea, cyanosis and renal disturbances. In Antipyrine poisoning a rash resembling measles usually appears. In Anilin poisoning the pulse is small and frequent; the patient smells of Anilin; the urine may be brown to brown-black; at the end coma and convulsions; jaundice often follows recovery. The outward application of Anilin causes eczema. In chronic poisoning by Anilin the perspiration has a reddish color.]

TREATMENT:

Put patient in the recumbent position.

Loosen clothing; supply fresh air and give Oxygen if possible, to overcome the cyanosis.

1. **Evacuate the stomach;** syphon out the stomach with a stomach-tube, or give an emetic of Zinc Sulphate (20 grains dissolved in a wineglassful of water, repeated once in 15 minutes if necessary), or Mustard (a tablespoonful in a small cupful of warm water, repeated in 15 minutes if vomiting has not occurred). Give saline purgative.

2. **Stimulate** with Caffein Citrate (1 to 4 grains



APPEARANCE
OF STOMACH
IN POISONING BY
CARBOLIC
ACID
(BRUNDAGE)

See page 63—Note 303

every $\frac{1}{4}$ to 1 hour), or Tincture of Digitalis (15 to 30 drops by mouth, or half as much hypodermically, every $\frac{1}{2}$ to 2 hours), or Digitalin (1/100 grain hypodermically every $\frac{1}{4}$ to 1 hour).

Encourage respiration by giving Strychnine Sulphate (1/60 to 1/20 gr. doses every $\frac{1}{4}$ to 2 hours).

Sustain blood pressure by Atropine Sulphate (1/120 to 1/60 gr. hypoderm. every $\frac{1}{2}$ to 2 hours).

3. **Employ artificial heat** (apply bags or bottles of hot water, or bricks, stove-lids, or bags of salt, heated), to maintain the bodily temperature.

4. **Perform artificial respiration if necessary** (rhythmically raise arms extended at sides to up over head and back again, 18 times a minute).

In poisoning by inhaling Anilin, fresh air, oxygen inhalations, ether injections and general stimulation are the best measures to employ.

ACID ACETIC—VINEGAR.

HISTORY:

Glacial Acetic Acid, used to destroy warts, may be mistaken for medicine. A large quantity of Vinegar may be taken by mistake and act as a poison. Concentrated Acetic Acid is very corrosive.

Fatal dose: 1 oz. concentrated Acetic Acid.

Symptoms and treatment as in Mineral Acids (q. v.).

ACID CARBOLIC (PHENOL, PHENIC ACID) —CREOSOTE—GUAIACOL. (See colored plate.)

HISTORY:

Carbolic Acid, a coal tar, is a colorless product when anhydrous; upon adding 5 per cent. of water it becomes liquid; upon exposure to light it may turn red. It is a powerful escharotic and neurotic poison. It is the poison most commonly used for

NOTE.—The normal appearance of the mucous surface of the stomach is nearly or quite white, except during the period of digestion, when it is more or less reddened. The author has intended that his colored plates should illustrate gastric conditions in severe poisonings. Largely through the courtesy of Drs. Schultze and O'Hanlon (Coroners' Physicians, New York City), the author has been afforded exceptional opportunities to observe the effects of various poisons in fatal poisonings.

suicidal purposes, but is rarely used as a means of committing murder. A Carbolic lotion has been fatally administered by mistake for medicine. Poisoning sometimes results from the use of too strong an injection, from a spray, from a strong salve rubbed into the skin to cure itch or other skin affections, or from absorption when used as an antiseptic in surgical dressings. If urine becomes dark colored in using Carbolic Acid, discontinue use.

When fatal, death usually occurs in from $\frac{1}{2}$ to 4 hours after the poison has been taken. The shortest time has been in one case 3 minutes, in another 10 minutes; longest time, 60 hours, also 5 days.

Fatal dose of Acid, from a drachm up; usually $\frac{1}{2}$ to 2 ounces. As a rule, $\frac{1}{2}$ ounce fatal; 6 or 7 grains have caused dangerous symptoms; recovery from over an ounce. Death from $\frac{1}{4}$ ounce Creosote; recovery from $\frac{3}{4}$ ounce. Death due to cardiac and respiratory paralysis. If prompt, death may result from syncope; if prolonged, from apnoea.

SYMPTOMS:

Usually, but not always, an immediate burning pain from mouth to stomach, accompanied sometimes by vomiting; there is usually a whitening of the lips and mouth, also of the esophagus and stomach; the breathing is labored; as a rule there is dizziness and later loss of consciousness; low temperature; diminished and greenish, brownish or black urine, the urine and breath having the characteristic odor of Carbolic Acid or of Creosote; pupils contracted; collapse.

TREATMENT:

Death usually occurs so soon that treatment must be prompt to be effective.

Do not treat as for an acid. Remember that Carbolic Acid, although so called, is not an acid, but belongs to the class of bodies known as phenols, and has but feeble acid properties.

Phelps says: "Alcohol is a perfect antidote to the corrosive effects of Carbolic Acid." The corrosion produced by Carbolic Acid is superficial as a rule. In absence of extreme damage to mucosa of stomach (as indicated by small quantity of poison taken, its not being in pure state, just taken, or pain not being very severe), the stomach-tube may, as a rule, safely be introduced. When corrosion severe, omit evacuant treatment, and limit alcohol to 4 ounces, **well diluted**.

Avoid use of oils and glycerine (except milk), as they favor solution and absorption of the poison.

Antidotes: Alcohol, any soluble sulphate, soap-suds, vegetable demulcents, albumin, magnesia.

1. Give a cupful of **Alcohol** and water (4 ounces of each, or less water) and at once remove it with the stomach-tube, if possible, syphoning it out. If the stomach-tube is not at hand, may use Mustard (a tablespoonful in a small cupful of water), or much better, Apomorphine Hydrochlorate, hypodermically (1/10 grain). The Alcohol protects the stomach from the corrosive effects of the Carbolic Acid, probably by its dilution of the Carbolic Acid and its effects upon the walls of the stomach, delaying or preventing absorption. It also acts as a stimulant. The Apomorphine not only has a prompt emetic effect upon the more or less paralyzed stomach, but also controls any inclination to acute alcoholism. (Owing to the anesthesia of the mucous membrane of the stomach, emetics are, as a rule, not very effective).

If Alcohol is not at hand, use a cupful of clear Whisky, Brandy, Gin, Cider Vinegar, or Rum for the Alcohol they contain.

The administration of the alcoholic preparation, followed by evacuation of the stomach (if possible by the stomach-tube), should be repeated every 5 to 10 minutes, from 4 to 8 times, according to the severity of the poisoning. Washing out freely with much water is also good secondary treatment.

In the absence of Alcohol, a very dilute Acetic Acid

has been employed. Chiefly owing to its albuminous nature, milk is beneficial; also white of egg.

2. **Administer one of the soluble sulphates next**, such as Sodium or Magnesium Sulphate (in $\frac{1}{2}$ to 2 ounces, or 1 to 2 tablespoonfuls, doses in a cupful of water) to hasten the elimination of such portion of the Carbolic Acid as may have entered the circulation. Half a pint of such solution, $\frac{1}{4}$ the strength, should be left in the stomach for continued absorption.

3. **Stimulate heart, circulation, and respiration** by Atropine Sulphate ($\frac{1}{120}$ to $\frac{1}{60}$ grain hypodermically every $\frac{1}{2}$ to 2 hours), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief, using one every 15 to 30 minutes). A hypodermic injection of Sulphuric Ether (15 minims) may be employed. A hypodermic injection of Strychnine Sulphate ($\frac{1}{60}$ to $\frac{1}{20}$ grain every $\frac{1}{4}$ to 2 hours), or Tincture of Digitalis (5 to 10 drops), or Digitalin ($\frac{1}{100}$ grain) every $\frac{1}{2}$ to 2 hours, may be helpful. Artificial respiration if required.

4. **Employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body), to maintain bodily temperature.

5. **Give demulcents** (such as milk, white of egg, flaxseed, or elm tea, gruel or magnesia in water), as an after treatment, to soothe and protect the mucous membrane. When egg and milk are given, they serve to also nourish and sustain the patient.

Apply mustard paste to abdomen. Employ friction and faradism to extremities.

Among other treatments which have been recommended are Lime Water and Syrup of Lime; also soap-suds. Also Sodium Carbonate as a mouth wash.

6. **May give Opium** (Powdered Opium, 1 or 2 grains every $\frac{1}{2}$ to 2 hours), or Laudanum (20 drops every $\frac{1}{2}$ to 2 hours by mouth, or $\frac{1}{2}$ teaspoonful in gruel by rectum as frequently), or Morphine Sulphate ($\frac{1}{4}$ grain by mouth or hypodermically every

$\frac{1}{4}$ to 2 hours), to relieve pain and nervous irritability if present and severe.

The treatment for poisoning by Creosote is the same as that for Carbolic Acid.

In poisoning by absorption from antiseptic dressings, a lotion of 5 per cent. solution of Sodium Sulphate is said to be an efficient antidote. Vinegar, especially Cider Vinegar, or oil (after alcohol), are efficient dressings in external injury or corrosion.

ACID CARBONIC [GAS] (CARBON DIOXIDE, CHOKER DAMP).

HISTORY:

Poisoning by breathing foul air of an overcrowded room or one in which there is a charcoal or gas stove and insufficient ventilation; air of wells, cellars, mines, or other excavations or inclosures illy ventilated or poisoned by decomposition or gas following explosions.

Fatal dose: 10 to 15 per cent. of this gas in the atmosphere is considered fatal; 2 per cent. is dangerous if long breathed.

SYMPTOMS:

• Throat inflamed; sense of weight and pains in head; drowsiness; giddiness; ringing in ears; loss of muscular power; dyspnoea; lividity of face and body; violent heart action; convulsions; coma; death.

TREATMENT:

1. Carry patient at once into pure air. If possible give Oxygen inhalations. If respiratory movements have ceased, dash cold water on the face and chest to awaken by reflex action; if there is no effect, resort to artificial respiration, and keep it up for an hour. If heart has stopped, strike sharp, quick blows upon the chest, in the heart region. Inhalations of Ammonia, or of Amyl Nitrite, or an enema of strong coffee is sometimes serviceable. If

the heart does not begin to beat soon after beginning artificial respiration, the jugular vein may be opened (avoid entrance of air) to relieve distention of the right ventricle. [The jugular is selected because there are no important valves between it and the heart].

2. Friction and heat applied to the extremities. Electricity (interrupted current to limbs). Stimulants. Inject a pint of hot strong coffee into rectum. Use catheter if long unconscious.

ACID CHROMIC — NEUTRAL CHROMATE OF POTASH — BICHROMATE OF POTASH — NEUTRAL CHROMATE OF LEAD (CHROME YELLOW).

HISTORY:

Persons engaged in the manufacture of Potassium Bichromate experience a nauseating bitter taste in the mouth, sneezing, irritation of nose and eyes, sores on the hands and body. Wherever skin denuded it acts as a cauter. Has a tendency to attack septum of nose, which it may destroy.

Potassium Bichromate is much used for dyeing purposes. 2 drachms have caused death in 4 hours, but $\frac{1}{2}$ ounce has been recovered from. A piece of Chromate of Potash the size of a hazel nut has caused death. Breathing Chromate of Lead dust has caused death, also eating cake ornaments containing this poison.

SYMPTOMS:

Pain in the stomach; colic; cramps in legs; vomiting; purging; dilated pupils; great depression; collapse. Chromic Acid vomit produces yellow stain on cloth.

TREATMENT:

1. Evacuate the stomach. In poisoning by the acid employ stomach-tube and much water to sy-

phon out stomach; or use Mustard (a tablespoonful in a wineglassful of tepid water, repeating every 15 minutes until vomiting occurs). If Mustard is not at hand, may use Zinc Sulphate (20 grains, repeating in 15 minutes if necessary), or give Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 minutes until effective), or give Apomorphine Hydrochlorate, hypodermically ($1/10$ grain, repeating in 15 minutes if necessary). Give Calcined Magnesia, or Magnesium Carbonate (1 to 4 tablespoonfuls stirred up in a cupful of milk or water) freely, as an antidote. Lime water, or chalk in water may be freely used.

2. **Stimulate heart, circulation, and respiration** by Atropine Sulphate ($1/120$ to $1/60$ grain hypodermically every $1/2$ to 2 hours), and by inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief, using one every 15 to 30 minutes). A hypodermic injection of Sulphuric Ether (15 minims) may be employed. A hypodermic injection of Strychnine Sulphate ($1/60$ to $1/20$ grain every $1/4$ to 2 hours) may be helpful.

3. **Employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body) to maintain bodily temperature.

4. Protect the mucosa of the stomach by administering demulcents (such as milk, gruel, flaxseed or elm tea).

6. **Give Opium** (Powdered Opium, 1 or 2 grains every $1/2$ to 2 hours), or Laudanum (20 drops every $1/2$ to 2 hours by mouth, or $1/2$ teaspoonful in gruel by rectum as frequently), or Morphine Sulphate ($1/4$ grain by mouth or hypodermically every $1/4$ to 2 hours), to relieve pain and nervous irritability if present and severe.

**ACID HYDROCYANIC (PRUSSIC ACID) —
BITTER ALMONDS, AND THEIR OIL —
CHERRY LAUREL WATER—SCHEELE'S
ACID — ETC. (See colored plate, p. 317.)**

HISTORY:

Poisoning may be the result of accident, suicidal intentions, or the effort to commit murder. It has resulted from inhaling the vapor of the anhydrous acid, from the use of the cyanides, from the acid itself, or from vegetable substances containing amygdalin. This latter substance readily undergoes decomposition, resulting in Hydrocyanic Acid and other products. Hydrocyanic Acid is a constituent of bitter almonds, cherry laurel, cherry, peach and plum pits. The Dilute Hydrocyanic Acid should contain 2 per cent. of the anhydrous acid. Oil of Bitter Almonds contains 10 to 15 per cent. of Hydrocyanic Acid.

The acid is equally severe in its action whether swallowed, inhaled, dropped into the eye, or applied externally. It may cause death in 2 minutes. Death has been delayed to $1\frac{1}{2}$ hours, but usually occurs within 15 minutes; may occur instantly. Inhalation of the vapor has caused death.

Hydrocyanic Acid enters the blood, forming a compound with its hemoglobin, passes to the medulla oblongata, and paralyzes centres of respiration.

Fatal dose: $\frac{6}{10}$ to $\frac{9}{10}$ gr. of the anhydrous Acid; 40 min. of Dilute Hydrocyanic Acid (U. S. P.); recovery after $\frac{1}{2}$ oz. 2% sol. (4.8 gr.); recovery after 1 drachm of Scheele's Acid (equal to $2\frac{2}{3}$ grains of the anhydrous acid); 80 almonds fatal; 4 to 6 will poison a child. Death after 17 drops of Oil of Bitter Almonds; also recovery after 4 drachms; but 20 drops is considered a fatal dose. Death in 2 min. to $3\frac{1}{2}$ hrs.

SYMPTOMS:

The symptoms come on in the very act of swallowing or almost immediately. The breath has the

characteristic odor of Bitter Almonds. Respiration difficult and expiration prolonged; pulse imperceptible; eyes glassy and prominent; pupils dilated; wild cries; involuntary urination and defecation; convulsions; asphyxia; cyanosis; paralysis; general collapse; coma; death.

TREATMENT:

There is no known, altogether reliable, antidote, although Ferrous Sulphate (in 5 to 10 grain doses) has been claimed to be a good chemical antidote. The following has been recommended, because it results in forming Prussian Blue: Give Magnesia (1 teaspoonful) stirred up in water; then in water 16 drops of Perchloride of Iron and $12\frac{1}{2}$ grains of Ferrous Sulphate. Cobalt Nitrate has proved efficacious in many cases.

Put the patient in a horizontal position out in the air.

Resort to artificial respiration, usually necessary. The most serviceable methods in great emergency are the use of Ammonia, diluted, by inhalation, hypodermically and by mouth; Chloride of Lime alone or moistened with vinegar and held to the nose; the employment of douches of cold water poured from a height, cold affusions to the spine, friction, and the resort to artificial respiration.

A mixture of the Ferrous and Ferric Sulphates as an antidote, to be followed by a solution of Potassium or Sodium Carbonate, or Hydroxide, the combination producing the inert Prussian Blue in the stomach, has been highly recommended.

If there is time to do anything besides resorting to artificial respiration and stimulation, give the iron preparation and employ the following measures:

1. **Evacuate the stomach** (after antidote), with stomach-tube until odor of acid absent, or tickle fauces with feather, or press finger down throat, or give emetic of Mustard (tablespoonful in wine-

glassful of water), or Zinc Sulphate (20 grains in a tablespoonful of water). It has been recommended to wash out the stomach with a dilute solution of Hydrogen Peroxide or Potassium Permanganate in order to change, if possible, the Hydrocyanic Acid into the nearly harmless oxamid; or may give Potassium Carbonate (20 grains in a wineglassful of water) immediately followed by Copperas (10 grains) and Tincture of Iron (1 teaspoonful in 2 tablespoonfuls of water); or may give Javelle Water (1 teaspoonful in a cupful of water), or Chlorine Water (a tablespoonful in a cupful of water), or use a Chlorine spray. May give a hypodermic injection of the ordinary solution of **Hydrogen Peroxide** ($\frac{1}{4}$ of a teaspoonful every 5 minutes until respiration and circulation improve, then occasionally). Also stimulate with hypodermic injections of Atropine Sulphate ($\frac{1}{120}$ to $\frac{1}{60}$ grain doses), or may use Chloric Ether (15 minims) hypodermically.

2. **Employ douches**; pour cold water on face, and alternately hot and cold water on chest and spine.

3. **Stimulate**. Give inhalations of Ammonia. Also give Aromatic Spirit of Ammonia, Brandy or Whiskey (1 teaspoonful in a little water every 5 to 15 minutes by mouth, or in double quantity by rectum, or in half quantity hypodermically).

4. **Employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body), to maintain bodily temperature.

5. **Apply electricity**. Employ a faradic current, applying it to the chest walls, particularly over the heart.

Sometimes must resort to tracheotomy.

If can keep patient alive for about half an hour, recovery is as a rule quite certain.

ACIDS MINERAL (CONCENTRATED): HYDROCHLORIC (MURIATIC ACID, SPIRIT OF SALT)—NITRIC (AQUA FORTIS)—PHOSPHORIC—SULPHURIC (OIL OF VITRIOL)—NITRO-HYDROCHLORIC (AQUA REGIA)—NITRO-SULPHURIC (AQUA REGINAE). (See colored plates pp. 175 and 212.)

HISTORY:

When Hydrochloric Acid poisons, it is usually the result of mistaking it for beer or other beverages. Poisoning by Nitric Acid is usually the result of accident or attempted suicide. Poisoning by Sulphuric Acid is usually the result of mistaking it for a beverage or attempted suicide. Although primary effects of these acids may be recovered from, secondary effects, consisting of stricture of esophagus or stomach, or perforation of esophagus, resulting in death, are apt to occur in a year or two. But the effects are local, not remote. The dangerous qualities of Sulphuric Acid are in proportion to its degree of concentration rather than to the quantity taken.

Fatal dose: Hydrochloric Acid, $\frac{1}{8}$ to 1 ounce; usually 1 ounce; recovery has occurred from 1, also 2 ounces; shortest fatal period, 2 hours.

Nitric Acid, 2 drachms; $\frac{1}{2}$ ounce has been recovered from; shortest fatal period, $1\frac{3}{4}$ hours.

Sulphuric Acid, 1 drachm; greatly depends upon the quantity of food in the stomach; recovery has taken place after 2 ounces; average fatal period, 16 to 24 hours; shortest period, $1\frac{3}{4}$ hours.

Death from Concentrated Mineral Acids by asphyxia or collapse or perforation of the stomach. Death usually occurs within 24 hours.

SYMPTOMS:

Pain throughout digestive tract; thirst intense; swallowing difficult; vomit dark-colored and containing mucous shreds, parts of membrane of esophagus.

phagus and stomach, perhaps blood; feeble pulse, clammy skin; collapse; cough, difficult respiration; sometimes constipation; usually stains on lips. Hydrochloric Acid produces on dark cloth first bright red color, which after some days becomes a reddish-brown or yellow. White stains on skin. Mucous membrane of mouth and tongue is gray or white. Nitric and Nitrohydrochloric Acids produce first white, then yellow, and finally brownish-red stains on lips and skin. Stain clothing yellow. Sulphuric Acid produces black stains and corrosion on lips, and chars clothing, or stains dark cloth red or brownish-red; stains other colored materials a bright reddish or yellowish; white linen black. (These acids may not stain lips.)

TREATMENT:

Do not use stomach-tube, stomach-pump, or emetics with concentrated acids, lest the former perforate the wall of the esophagus or stomach, or the latter rupture the stomach. Chalk, Potassium, or Sodium Carbonate or Bicarbonate, although antidotes, should not be used, lest the gas generated rupture the weakened wall of the stomach.

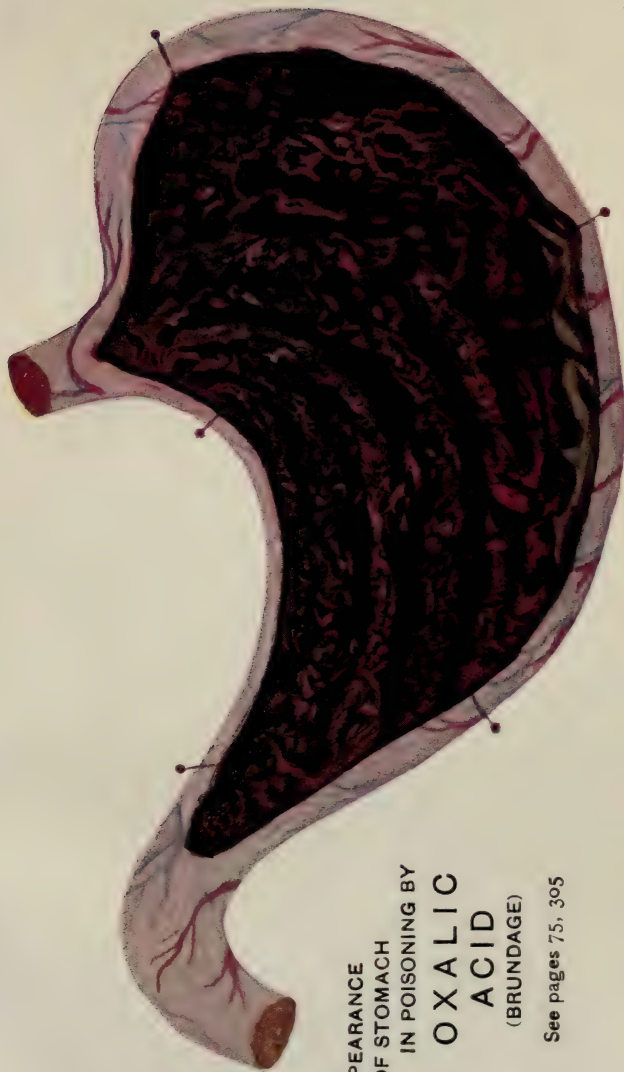
Avoid water, unless given rapidly in very large quantity, in poisoning by Sulphuric Acid, as it generates heat, thus increases injury to the stomach.

Antidotes: Much water, magnesia, soap, albumin, lime water, whiting, wall plaster, demulcents.

1. Give much water at once and Calcined Magnesia in frequent doses (2 tablespoonfuls in a cupful of tepid water or milk). Lime water ad libitum. Soap-suds (as castile soap, dissolved in 4 times its bulk of hot water), given by the cupful until the stomach is soothed, give excellent results. After neutralizing acid give tepid water to aid emesis.

2. Give demulcents freely (white of egg, 1 in $\frac{1}{2}$ cupful of water; barley water, flour, flaxseed tea, gruel, starch water, olive oil, or milk), to soothe and protect.

3. May give Opium or Morphine Sulphate (a hypodermic injection of $\frac{1}{8}$ or $\frac{1}{4}$ grain), or Deodorized



APPEARANCE
OF STOMACH
IN POISONING BY
**OXALIC
ACID**
(BRUNDAGE)
See pages 75, 305

Tincture of Opium (10 to 15 drops) by mouth, to relieve pain.

Stimulants may be used hypodermically.

Apply heat to body.

Oil enemata benefit. External parts injured by these acids (as in "vitriol throwing") are benefited by bathing with soap and water, and treating like burns.

ACID OXALIC (ACID OF SUGAR)—POTASSIUM BINOXALATE (SALT OF SORREL, SALT OF LEMON)—ETC. (See colored plate.)

HISTORY:

Acid Oxalic is a crystalline substance whose crystals sufficiently resemble Magnesium Sulphate and Zinc Sulphate as to be mistaken for them. It is sometimes taken with suicidal intent. Salt of Sorrel is used for straw bleaching and removing ink and iron stains from linen, leather, paper, etc. It has been taken for suicidal purposes. It is an acid oxalate of Potassium, and is commonly called **Salt of Lemon**. It has been taken for Epsom Salt and Cream of Tartar, owing to similarity in appearance.

Fatal dose: 1 drachm of the solid acid has killed; usually $\frac{1}{2}$ to 1 ounce is fatal, but 1 ounce in solution has been recovered from. The solid acid or a strong solution of it has a corrosive effect. The local effect of a dilute solution is slight, usually, but the poison is absorbed and acts as a systemic poison. Half an ounce of the Salt of Sorrel has produced death. Although the soluble salts of Oxalic Acid are almost as poisonous as the acid itself, they are not as corrosive.

Death has occurred in from 3 to 10 minutes, but usually occurs in about an hour. Death has occurred as late as the fourteenth day.

Death by paralysis of respiration and heart. The time of death is not dependent upon the amount and concentration of the poison.

SYMPTOMS:

A hot acrid or intensely sour taste in mouth; burning sensation in esophagus and stomach; intense thirst; distressing cough; severe pain in head, abdomen, and back; tongue swollen; sense of suffocation; usually vomiting of highly acid, greenish, blackish-brown or bloody mucus; black and blue colored face; cold skin; coma; collapse; sometimes convulsions; urine contains crystals of Oxalate of Lime, albumin, and tube casts.

Oxalic Acid, in substance or in strong solution, acts locally as a corrosive upon the tissue with which it comes in contact, and also acts as a true poison. Upon the concentration of the solution depends the predominance of either action. Oxalic Acid in a large dose, and dissolved in a small quantity of water, produces immediate and severe symptoms. In the reverse state the symptoms are delayed and less severe. Death may be caused by dilute solutions without either pain or vomiting having been present, the symptoms being similar to those produced by narcotic poisoning.

TREATMENT:

Treatment must be prompt. The chemical antidote is **Lime in any form** (such as lime, chalk, whiting, or wall plaster, given freely in water).

1. Give at once Magnesia (2 tablespoonfuls in a gill of milk or water), or slaked lime suspended in a small quantity of water or mucilaginous fluid. It forms an insoluble oxalate. Saccharated Solution of Lime, or **some soluble Salt of Calcium, or Magnesium**, either suspended or dissolved in a **very small quantity of water**, or in some demulcent, as milk, mucilage, or oil, is the proper antidote. Calcium Carbonate, in the form of prepared chalk (2 teaspoonfuls at a dose), or Precipitated Calcium Carbonate (2 teaspoonfuls at a dose), is very satisfactory, as with Oxalic Acid it forms Calcium Oxalate, an inert substance. Ordinary chalk, wall plaster, whiting,

or powdered oyster shells, in water, or syrup of lime, or a large quantity of lime water, may be administered when better antidotes are not readily obtainable.

Alkalies, such as **Ammonia**, **Potash** or **Soda**, and their **Carbonates** or **Bicarbonates** should not be administered, as they form soluble compounds which are almost as poisonous as the acid itself.

If the poison has been taken in a solid form, or it is not known in what form it was taken, avoid use of much water, as by dissolving the poison it favors the absorption of the same.

2. **May conditionally evacuate the stomach.** If poison was not taken in solid form, and was not concentrated enough, or has not been swallowed for a long enough time to have destroyed the mucous membrane (as indicated by severe burning pain, often accompanied by signs of collapse) and vomiting has not occurred spontaneously, may use a stomach-tube to syphon out the stomach, or resort to an emetic. **Avoid the use of the stomach pump.**

In syphoning out the stomach, use **Lime Water**, with or without oil, followed by pure water. **Milk of Magnesia** may be substituted for the **Lime Water**.

Except in very aggravated cases, **emetics** may be employed, even though it be unsafe to use the stomach-tube. **Tickling the fauces with a feather or the finger** will often produce vomiting, and is the safest method.

If not successful may give: **Zinc Sulphate** (20 grains in 2 tablespoonfuls of water, repeated every 15 minutes if necessary), or **Mustard** (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or **Ipecacuanha** (Powdered **Ipecacuanha**, 30 grains), or **Syrup of Ipecac**, a teaspoonful every 10 to 15 minutes until vomiting results; or still better, **Apomorphine Hydrochlorate**, **hypodermically** ($\frac{1}{10}$ grain, repeated every 15 minutes until effective).

3. **Give Castor Oil** (2 tablespoonfuls), or **Magne-**

sium Sulphate (1 to 2 tablespoonfuls in a cupful of water), to clear out the intestines.

When water is admissable, much should be given to encourage elimination of the poison by the kidneys.

Apply poultices to the abdomen, and hot fomentations to the loins.

4. **Employ stimulants freely upon signs of collapse** (such as Brandy or Whisky (in tablespoonful doses in a little water), **but only per rectum**).

5. **Give Opium** (Powdered Opium, 1 to 2 grains), or Laudanum (20 to 30 drops at a dose), or give Morphine Sulphate, hypodermically ($\frac{1}{4}$ grain every $\frac{1}{2}$ to 2 hours), if pain is severe.

6. **Give demulcents** (such as white of egg, milk, oil, gum arabic, flaxseed or elm tea, barley or starch water, oatmeal gruel, gelatin, or flour and water, or crushed bananas), to soothe and protect the irritated and inflamed surface, as an after treatment.

ACID SALICYLIC — SALOL.

HISTORY:

Salicylic Acid is used as a preservative for keeping cream, wine, lager beer, cider, jams, etc. Death from about an ounce taken in 4 days.

Death results from paralysis of respiration.

SYMPTOMS:

Dilated pupils; quick, deep respirations; dyspnoea; flushed face; ringing in ears; deafness; delirium; may be nose-bleed.

TREATMENT:

1. **Evacuate the stomach**; syphon out the stomach with a stomach-tube, using plenty of water. If stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 15 minutes if vomiting is not produced), or Cupric Sulphate (3 to 5 grains in 2 tablespoonfuls of water every 5 to 10 minutes until

it acts), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($1/10$ grain, repeated every 15 minutes until effective. After emetic, always give plenty of luke-warm water to encourage vomiting.

2. **Stimulate heart, circulation, and respiration** with Brandy or Whisky (2 teaspoonful doses every 10 to 15 minutes, or $1/4$ teaspoonful doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $1/4$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($1/60$ to $1/20$ grain hypodermically every $1/2$ to 2 hours) and Atropine Sulphate ($1/120$ grain hypodermically every $1/2$ to 2 hours), or Tincture of Belladonna (20 drops in water every $1/2$ to 2 hours). Tincture of Digitalis (15 to 30 drops by mouth, or half as much hypodermically, every $1/2$ to 2 hours), or Digitalin ($1/100$ grain hypodermically every $1/2$ to 1 hour), or Caffein Citrate (1 to 4 grains every $1/4$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $1/4$ to 1 hour if necessary) may be used for the same purposes. Draughts of strong coffee may also be given.

3. **Employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body), to maintain bodily temperature.

4. **Give demulcents:** milk and white of egg.

ACID, SCHEELE'S.
(See Acid Hydrocyanic.)

ACID SULPHURIC.
(See Acids Mineral.)

ACID TARTARIC.**HISTORY:**

Taken by mistake for an aperient.

Fatal dose: 1 ounce.

SYMPTOMS:

Abdominal pain; vomiting; prostration; convulsions; collapse; death.

Antidote: Lime or chalk.

1. **Give Lime Water freely;** or Prepared Chalk (in 2 teaspoonful doses in a small cupful of water every 15 to 30 minutes), or Magnesia (2 tablespoonful doses in a small cupful of water, repeated every 10 to 15 minutes), or may give with benefit soap suds, or Carbonate or Bicarbonate of Sodium or Potassium in water.

2. **Give demulcents** (such as white of egg, milk, oil, gum arabic, flaxseed or elm tea, barley or starch water, oatmeal gruel, gelatin, flour and water, or even crushed bananas), to soothe and protect the irritated and inflamed surfaces.

3. **Give Castor Oil** (2 tablespoonfuls) to clear out the intestines.

4. **Stimulate** if necessary (as described under Jalap (q. v.).

ACIDS, VEGETABLE (CORROSIVE):**ACETIC—OXALIC—TARTARIC.**

Symptoms and treatment under each name (q. v.).

ACONITE (MONKSHOOD, WOLFSBANE)—**ACONITINE—PULSATILLA—****ANEMONIN.****HISTORY:**

Aconite is an active poison. The plant Monkshood, Wolfsbane or Blue Rocket (*Aconitum Napellus*) is found growing in cottage gardens. All parts of it are poisonous. The root may be mis-

taken for horse-radish, and the leaves have been eaten in salad by mistake. Tincture of Aconite has been mistaken for cordial, and Fleming's Tincture mistaken for a harmless medicine, and Aconite liniment taken instead of medicine. An overdose of strong tincture is sometimes taken for a cold. Aconite has been used for purposes of suicide and for murder. Pills containing Aconite are sold and indiscreetly used in the treatment of neuralgia. Aconite has been much used by the Hindoos to poison wild beasts and also human beings.

Fatal dose: 1 drachm of the root; 25 drops of the tincture; 4 grains of the extract; $1/16$ of a grain of the alkaloid; $1/50$ grain nearly caused death; about $1/35$ grain by the mouth is believed to be fatal as a rule; hypodermically 1.5 mgrms. Fatal results usually within 3 or 4 hours; has occurred in 8 minutes and has been delayed to 4 days. 80 drops of the Tincture of Aconite taken in 10 doses caused death in 4 days.

Death results from asphyxia or syncope.

SYMPTOMS:

Tingling in mouth, throat and extremities; anesthesia of surface; muscular weakness, hence staggering; dizziness; burning pain in stomach or abdomen; dilated pupils; slow, weak, irregular pulse; voice suppressed; skin covered with cold sweat; shallow, slow, feeble respiration; face pale; sight often poor; eyes fixed and staring; deafness; vomiting not common, but may begin in an hour, and is then severe; syncope. Patient often conscious to the last.

TREATMENT:

Put the patient in a horizontal position, the head lower than the feet, to prevent syncope. Maintain absolute quiet.

If there is time to do more than employ artificial respiration and stimulation, resort to the following:

1. **Endeavor to wash out the stomach**, syphoning with a stomach-tube and much water. It is usually advisable to avoid emetics, as they act poorly and exhaust the patient. If given, give cautiously.

Give Tannic Acid as an antidote (in 5 grain doses), followed by water, or **Animal Charcoal** (powdered and stirred up in water), or the following mixture may be given, to arrest the solubility of the poison: Iodine, $\frac{3}{4}$ grain; Potassium Iodide, 2 grains; water, 1 ounce.

Give a dose of Castor Oil.

2. **Stimulate heart, circulation, and respiration** with hypodermic injections of Ether (10 minims every 10 to 30 minutes), or with Brandy or Whisky (in 2 teaspoonful doses every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful doses hypodermically as frequently); also with Ammonia inhalations or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes by mouth, or $\frac{1}{4}$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($\frac{1}{60}$ to $\frac{1}{20}$ grain hypodermically every $\frac{1}{4}$ to 2 hours) and Atropine Sulphate ($\frac{1}{120}$ grain hypodermically every $\frac{1}{2}$ to 2 hours). **Tincture of Digitalis**, as the physiological antidote (30 drops by mouth, or half as much hypodermically, every $\frac{1}{4}$ to 2 hours), or Digitalin ($\frac{1}{100}$ grain hypodermically every $\frac{1}{4}$ to 1 hour), should be given. Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour), may be used for supporting purposes. Draughts of strong coffee may be given. Also Nitroglycerine.

3. **Employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body), to maintain bodily temperature.

4. **May give Opium** (Powdered Opium, 1 or 2 grains every $\frac{1}{2}$ to 2 hours), or Laudanum (20 drops every $\frac{1}{2}$ to 2 hours by mouth, or $\frac{1}{2}$ teaspoonful in gruel by rectum as frequently) or Morphine Sulphate ($\frac{1}{4}$ grain by mouth or hypodermically every

$\frac{1}{2}$ to 2 hours), to relieve pain and nervous irritability.

Apply a mustard paste to the pericardium, and rub the back and legs with hot towels.

Resort to artificial respiration if necessary (rhythmically raising and lowering arms from straight at sides to up over head and back again, 18 times per minute).

ALCOHOL, AMYL ("FUSEL OIL," POTATO SPIRIT).

HISTORY:

A poisonous and hypnotic preparation from corn-whisky and potato-whisky.

SYMPTOMS:

Slow, shallow respiration; small pupils; breath resembling odor of Amyl Nitrite; muscular rigidity.

TREATMENT:

1. **Evacuate the stomach;** syphon out the stomach with a stomach-tube, using plenty of water. If a stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 10 to 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically (1/10 grain, repeated every 15 minutes until effective). After giving the emetic, give plenty of luke-warm water to encourage vomiting.

2. **Stimulate heart, circulation, and respiration** with Brandy or Whisky (2 teaspoonful doses by mouth every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little

water every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($\frac{1}{60}$ grain hypodermically every $\frac{1}{4}$ to 2 hours) and Atropine Sulphate ($\frac{1}{120}$ to $\frac{1}{60}$ grain hypodermically every $\frac{1}{2}$ to 2 hours), or Tincture of Belladonna (20 drops in water every $\frac{1}{2}$ to 2 hours). Tincture of Digitalis (15 to 20 drops by mouth, or half as much hypodermically every $\frac{1}{2}$ to 2 hours), or Digitalin ($\frac{1}{100}$ grain hypodermically every $\frac{1}{4}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary), may be used for the same purposes. Draughts of strong coffee may also be given.

ALCOHOL, ETHYL OR GRAIN—BRANDY — WHISKY — GIN — RUM — WINES — BEER — CIDER. (See colored plate, p. 307.)

HISTORY:

Symptoms of poisoning usually appear within an hour.

The fatal dose of Alcohol varies. $2\frac{1}{2}$ ounces killed a boy of 9 and a girl of 5 years of age. 4 ounces of Brandy killed a child of 7. The toxic dose of Absolute Alcohol, contained in Brandy, Gin, etc., considered to be $2\frac{1}{2}$ to 5 ounces; smallest fatal dose conc. Alcohol, $3\frac{1}{2}$ to 7 ounces.

Death has resulted in adults from half a pint of Gin; from 2 bottles of Port. Recovery from a quart of Gin, a quart of Whisky, 2 bottles of Port, a pint and a half of mixed Gin and Brandy. Death in child from $\frac{1}{2}$ pint of Gin; also from 2 ounces of Gin; from 1 ounce of Brandy. Recovery from 3 ounces of Rum.

Death by paralysis of heart in minutes, hrs. or days. "Absolute Alcohol" is Alcohol free from water. "Proof Spirit" is a mixture of spirit and water, containing 49.24 per cent. of Alcohol, i. e., about half and half. "Methylated Spirit" is spirit mixed with

10 per cent. of Wood Naphtha. Percentage of Alcohol in some alcoholic drinks: Brandy, 53; Rum, 40 to 53; Whisky, 53 to 54; Gin, 40 to 51; Port, 20 to 25; Sherry, 15 to 19; Burgundy, 13 to 14; Claret, 10 to 17; Hock, 8 to 10; Strong Ale, 6; Stout, 6; Porter, 4; Small Beer, 1 to 2; Weiss Beer, 1; Cider, 6.

SYMPTOMS:

Confusion of mind; giddiness; relaxation of the whole body; hallucinations; stupor; anesthesia; coma; pulse rapid, weak, compressible; skin cool and moist; pupils usually dilated; face ghastly or bloated; temperature reduced; lips livid; conjunctivæ red; breathing noisy; may be convulsions. The symptoms of Alcohol poisoning often resemble apoplexy, concussion of brain, and Opium poisoning. There is an odor of Alcohol on the breath; may be bloody froth on lips.

An important diagnostic sign is that the patient may usually be aroused for a short time. (See chart p. 295).

TREATMENT:

Provide fresh air.

1. **Evacuate the stomach;** thoroughly syphon out the stomach with tepid water, or use an emetic of Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if necessary), or Zinc Sulphate (20 grains in half a wineglassful of water, repeated every 15 minutes until effective).

Ammonium Chloride (30 grains in $\frac{1}{2}$ pint of water given at one draught) sometimes remarkably restores.

2. **Support.** Give Strychnine Nitrate ($\frac{1}{60}$ to $\frac{1}{20}$ grain every $\frac{1}{2}$ to 2 hours hypodermically). To counteract the stupor give Aromatic Spirit of Ammonia (in $\frac{1}{2}$ teaspoonful doses every 15 minutes, or one-half as much hypodermically). Give inhalations of Aqua Ammonia, or use Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and in-

haled, using one every 15 to 30 minutes), to encourage respiration. Also give Atropine Sulphate, hypodermically (in $1/120$ grain doses every $1/4$ to 2 hours), or Tincture of Belladonna (in 20 drop doses) every $1/2$ to 2 hours). Give Caffein Citrate (1 to 4 grains every $1/2$ to 2 hours), or strong coffee ($1/2$ pint). Digitalin hypodermically ($1/100$ gr. every $1/4$ to 1 hour).

3. **Employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body), to maintain bodily temperature. Cold affusions to head. Friction.

For asphyxia employ galvanic current; for mania, Hyoscine and Morphine. Catheterize a distended bladder. Give Oxygen.

ALCOHOL, METHYL (WOOD SPIRIT, WOOD ALCOHOL, "COLUMBIAN SPIRITS," ETC.)

HISTORY:

The swallowing, or even exposure to the fumes of Wood Spirit, has produced very serious results. The drinking of Bay Rum, Essence of Ginger and other preparations, which had been made from Wood Spirit, has produced violent symptoms and even permanent blindness. When swallowed, Wood Spirit with remarkable uniformity selects the optic nerve and retina for attack.

From a drachm to an ounce or more of Wood Spirit usually produces severe symptoms and often results in blindness. Bathing in water containing Wood Spirit has injured. Death in 1 or 2 days.

SYMPTOMS:

The symptoms usually appear about second or third day, unless dose large enough to produce coma.

The principal symptoms are nausea, vomiting and headache. Disturbance of vision does not as a rule appear until the third, fourth, or even fifth day. Total blindness then occurs in from 12 to 48 hours, if at all. In a few days slight vision is restored, but

soon again lost. May be excitement, coma, semi-coma, depression, a sense of coming and going of sight, eyeballs sensitive to pressure and rotation. May be loss of color sense. Quite often death occurs.

TREATMENT:

Pilocarpine Hydrochlorate (in $\frac{1}{8}$ to $\frac{1}{2}$ gr. doses) is best remedy (use early). Give Ethyl Alcohol, rectal injections of normal salt solution, also hot coffee. Potassium Iodide is helpful. In coma: warm baths, then cold affusions. Remainder of treatment as for Ethyl Alcohol (q. v.).

ALKALIES: AMMONIA—BARYTA (see Barium)—**LIME** (q.v.)—**POTASSA—SODA**, and **Their Carbonates.** (See colored plate p. 191.)

HISTORY:

Aqua Ammonia is sometimes taken by mistake for Lime Water or other liquid of similar appearance. Ammonia Liniment taken in similar way. Caustic Potash is rarely taken except by accident.

Fatal dose: 2 drachms of strong solution of Ammonia may be fatal; 4 drachms is usually fatal, but an ounce has been recovered from. Death from $\frac{1}{2}$ oz. of Caustic Potash. Death usually in 24 hours.

SYMPTOMS:

Burning pain from mouth to **stomach**; difficulty in swallowing; vomiting; may be vomiting and purging of mucous and blood; skin cold and clammy; pulse feeble; rapid exhaustion; symptoms of suffocation; convulsions; stupor or coma may be developed.

(Excessive **inhalations** of Ammonia are poisonous or fatal by the resulting bronchitis).

(Baryta Muriate and carbonate produce also headache, deafness, and dimness of sight).

TREATMENT:

1. As antidotes, give diluted acids, especially **vegetable acids**: Vinegar and water, equal parts; Acetic

Acid, diluted (a teaspoonful in $\frac{1}{2}$ pint of water); Citric Acid or Tartaric Acid ($\frac{1}{2}$ to 2 drachms in a pint of water), or clear lemon juice, or orange juice, freely.

The fixed oils (such as Castor, Cod Liver, Linseed, Almond, and Olive) form soaps with the free alkalies, and consequently destroy their caustic effects. Butter may be employed.

If there are signs of corrosion, as indicated by severe pain, collapse, etc., **do not use stomach-pump, stomach-tube, or emetics, for fear of perforation or rupture.**

Assist vomiting by copious draughts of tepid water. For inflammation apply leeches.

2. **Give demulcents** (such as white of egg, milk, oil, gum arabic, flaxseed or elm tea, barley or starch water, oatmeal gruel, gelatin, flour and water, or even crushed bananas), to soothe and protect the irritated or inflamed surfaces.

3. **Stimulate heart, circulation, and respiration** with Brandy or Whisky (2 teaspoonful doses every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful doses hypodermically as frequently); also with Strychnine Sulphate ($\frac{1}{60}$ to $\frac{1}{20}$ grain hypodermically every $\frac{1}{2}$ to 2 hours) and Atropine Sulphate ($\frac{1}{120}$ grain hypodermically every $\frac{1}{2}$ to 2 hours), or Tincture of Belladonna (in 10 to 15 drop doses). Tincture of Digitalis (30 drops by mouth, or half as much hypodermically, every $\frac{1}{2}$ to 2 hours), or Digitalin ($\frac{1}{100}$ grain hypodermically every $\frac{1}{2}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{2}$ to 1 hour if necessary) may be used for the same purposes. Draughts of strong coffee may also be given.

3. **Employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated,

applied to the feet and sides of the body), to maintain bodily temperature.

4. **Give Opium** (Powdered Opium, 1 or 2 grains every $\frac{1}{2}$ to 2 hours), or Laudanum (20 drops every $\frac{1}{2}$ to 2 hours by mouth, or $\frac{1}{2}$ teaspoonful in gruel by rectum as frequently) or Morphine Sulphate ($\frac{1}{4}$ grain by mouth or hypodermically every $\frac{1}{2}$ to 2 hours), to relieve pain and nervous irritability.

If life is threatened by œdema, promptly perform tracheotomy. When a dangerous quantity of Ammonia has been inhaled, give inhalations of Acetic Acid, Hydrochloric Acid, Chlorine Water, or Vinegar. Relieve pain by slight Chloroform inhalation.

ALKALOIDS.

HISTORY:

Tannin forms a comparatively insoluble tannate with alkaloids.

Potassium Permanganate is useful for some of the alkaloids.

TREATMENT:

Give Tannic Acid, Potassium Iodide, Albumin, Iodine, Charcoal, strong coffee or tea, emetics and cathartics.

For symptoms and treatment in detail see each alkaloid under respective title.

ALOES—BRYONIA—COLOCYNTH—ELATERIUM (SQUIRTING CUCUMBER)—ELATERIN—EUPHORBIIUM—GAMBOGE—"HIERAPICRA"—JALAP (q. v.)—MEZEREON—PHYSIC NUT—SCAMMONY, and similar Vegetable Irritants.

HISTORY:

Fatal dose: Aloes, $\frac{1}{3}$ to $\frac{2}{3}$ oz.; Podophyllin, 5 to 10 gr.; Elaterium, 6 or 8 grs.

SYMPTOMS:

Severe irritation of the intestinal canal, causing pain, vomiting, and purging; cold sweats; usually great prostration; sometimes convulsions; collapse.

TREATMENT:

1. **Evacuate the stomach;** syphon out the stomach with a stomach-tube, using water freely. If the stomach-tube is not at hand, or the poisonous substance is too large to be removed by it, use Zinc Sulphate (20 grains in a tablespoonful of water, repeated in 10 to 15 minutes if necessary), or Apomorphine Hydrochlorate, hypodermically (1/10 grain, repeated in 10 to 30 minutes if necessary). Give tepid water freely.

If the irritant has passed out of the stomach into the intestines, a purgative, such as Castor Oil (1 to 2 tablespoonfuls), or Epsom Salt (1 to 2 tablespoonfuls) should be given to remove it.

2. **Give demulcents** (such as white of egg, milk, oil, gum arabic, elm or flaxseed tea, oatmeal gruel, gelatin, starch or barley water, flour and water, or crushed bananas) to soothe the inflamed or irritated surfaces. Afterwards enemata of the same are soothing.

3. **Stimulate heart, circulation, and respiration** with Brandy or Whisky (a teaspoonful in water every 10 to 30 minutes, or 1/4 teaspoonful as often hypodermically).

4. **Give Opium** (Powdered Opium, in 1 to 2 grain doses every 1/2 to 2 hours), or Laudanum (10 to 20 drops in water every 1/2 to 2 hours), or Morphine Sulphate (1/4 grain hypodermically or by mouth every 1/2 to 2 hours), to relieve the pain and quiet the nervous system.

5. **Maintain the body heat** (by applying hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to body and extremities). Apply hot fomentations to the abdomen.

ALUM.**TREATMENT:**

Administer Ammonium or Potassium Carbonate or Bicarbonate as antidote. Use emetic and demulcents.

AMYL NITRITE — NITRITE OF ETHYL — NITRITE OF POTASSIUM — NITRITE OF SODIUM.

SYMPTOMS:

At first there is a violent heart action and flushing, from dilation of the capillaries; then there is diminished heart action and contraction of the capillaries; then follow great muscular relaxation; gradual loss of reflexes; yellow vision; pallor; dilated pupils; slow pulse; irregular respiration; sometimes vomiting and convulsions. Blyth says "Warm blooded animals may be thrown by Amyl Nitrite into a cataleptic condition. It is not an anesthetic, and by its use consciousness is not destroyed, unless a condition approaching death be first produced. When this occurs, there is rarely recovery; the animal passes into actual death."

TREATMENT:

N. B.—Whether poison was swallowed or inhaled, put patient in horizontal position and provide plenty of fresh air.

1. If the poison has been swallowed, evacuate the stomach; syphon out stomach with a stomach-tube, or use a hypodermic injection of Apomorphine Hydrochlorate ($1/10$ grain).

2. **Support.** Give Brandy or Whisky (in tablespoonful doses every 5 to 10 minutes, or $1/4$ teaspoonful doses hypodermically every 5 to 10 minutes). Give Strychnine Sulphate, hypodermically ($1/60$ to $1/20$ grain every $1/2$ to 2 hours). Aid heart by Tincture of Digitalis (15 drops every 10 to 20 minutes), or give Digitalin ($1/100$ grain every $1/2$ to 2 hours). May give Atropine and Ergotin.

3. **Douche.** Use alternate hot and cold douches to the chest.

4. **Resort to artificial respiration if necessary** (rhythmically raise and lower arms from straight

at sides to up over head and back again, 20 times a minute).

If the poison has been inhaled, employ Nos. 2, 3 and 4.

ANESTHETICS: CHLOROFORM — ETHER —NITROUS OXIDE (LAUGHING GAS)— ETC. (Chloral, p.119.)

HISTORY:

Chloroform is sometimes swallowed by mistake, but usually for suicidal purposes. Death from it is, however, usually the result of inhaling too much as an anesthetic. Ether is a less dangerous anesthetic than Chloroform, usually less productive of vomiting, and stimulates heart action. A sleeping person awakens almost instantly upon being exposed to the vapor of Chloroform. A true sudden narcosis is impossible. Chloroform kills 1 in 3000; ether, 1 in 16,000.

Fatal dose: Fatal dose by inhalation of Chloroform, from 15 drops up; by mouth, 1 drachm in boy of 14 years; half an ounce in adult; recovery from 5 ounces by mouth in adult. Probable fatal dose of Ether by mouth, 1 ounce; Chloroform, 1½ ounces.

Death usually by paralysis of respiration. In a few cases by cardiac paralysis. But in poisoning by Nitrous Oxide death is invariably due to asphyxia.

SYMPTOMS:

Chloroform: Stertorous, irregular, shallow breathing; dilated pupils; appearance of cloud passing over face; conjunctiva may be touched without patient flinching. **Symptoms are same when taken by mouth as when vapor is inhaled, but fatal results are deferred.**

Ether (Sulphuric Ether): Cyanosis; jugular pulsation; action of diaphragm suspended, followed by thoracic paralysis; weak, rapid pulse; shallow, labored, stertorous breathing; great reduction of body temperature; dropping of jaw. (Effects longer in appearing than in Chloroform).

Nitrous Oxide (Laughing Gas): A prominent symptom, usually, is delirious laughter.

TREATMENT:

When inhaled:

1. Remove anesthetic; invert patient; draw tongue well forward with forceps; maintain inverted position until pulse and respiration are good; expose patient to a current of pure air, or give Oxygen. Dash, alternately, hot and cold water on face and chest; in Ether poisoning also dash Ether on chest and abdomen.

Resort to artificial respiration without delay (slowly and regularly sweep extended arms up over head and back to sides, repeating 18 times a minute). Employ a weak electric current to encourage the action of the diaphragm; one pole on the pit of the stomach, other on the larynx.

2. Give hypodermic injection of Atropine Sulphate ($1/120$ grain, repeated every $1/4$ to 2 hours) and Strychnine Sulphate ($1/60$ to $1/20$ grain every $1/4$ to 2 hours), and Tincture of Digitalis (10 to 20 minims), or Digitalin ($1/100$ grain every $1/4$ to 2 hours). May also give Aromatic Spirit of Ammonia (15 minims in water every 10 to 30 minutes), by mouth or hypodermically. Give an enema of hot strong coffee (a pint). Amyl Nitrite or Nitroglycerine may also be used.

Apply Mustard to calves of legs and over heart.

Avoid hypodermic injections of Ether or Alcohol.

If heart is stopped, two or three blows on the chest may start it; sustain by rhythmical pressure over it. May arouse by slapping with wet towel.

3. Employ friction and apply external heat, in either poisoning (hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body), to maintain bodily temperature.

Dash Ether on chest and abdomen for shock stimulation. Also give inhalations of Amyl Nitrite (a

3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{2}$ to 1 hour if necessary), or inhalations of Ammonia.

As relapse may occur, do not leave patient for some time after apparent recovery.

When swallowed: If Chloroform or Ether have been swallowed.

1. **Evacuate the stomach:** syphon out the stomach with a stomach-tube, using water freely, or tickle fauces with a feather, or give Mustard (a tablespoonful in a wineglassful of water and repeat in 15 minutes if necessary), or give Apomorphine Hydrochlorate, hypodermically (in $\frac{1}{10}$ grain doses). Zinc or Copper Sulphate also after syphoning.

Give copious draughts of water containing 1 to 2 teaspoonfuls of Sodium Bicarbonate or Carbonate as antidote.

Demulcents may be necessary.

4. **Give Opium, to relieve pain when necessary.**— (Powdered Opium, 1 or 2 grains every $\frac{1}{2}$ to 2 hours), or Laudanum (20 drops every $\frac{1}{2}$ to 2 hours by mouth, or $\frac{1}{2}$ teaspoonful in gruel by rectum as frequently) or Morphine Sulphate ($\frac{1}{4}$ grain by mouth or hypodermically every $\frac{1}{2}$ to 2 hours), to relieve pain and nervous irritability.

Remainder of treatment as in poisoning by inhalation.

ANILIN INK OR DYES.

(See Acetanilid, etc.).

ANTIMONY AND ITS COMPOUNDS: ANTIMONIAL WINE — TARTAR EMETIC — ETC.

HISTORY:

Antimony has been taken by mistake for Epsom Salt, also for Sodium Carbonate. Has also been considerably used for secret poisoning and murder. The ointment has poisoned externally applied. The

action of Antimony has been mistaken for the effects of diseases, such as gastric or intestinal ulcer or cholera; also for Arsenic poisoning. Antimony is, however, sometimes contaminated with Arsenic. Test urine and vomited matter for Antimony to distinguish from disease. In poisoning by Antimony, urine never suppressed as in Arsenic. Prompt treatment is highly important.

Fatal dose: Tartar Emetic, $\frac{1}{2}$ grain has caused serious symptoms; $\frac{3}{4}$ grain killed a child in an hour; 2 grains killed an adult; $\frac{1}{2}$ oz. has been recovered from. Death from 2 oz. Antim. Trichlor.

Death usually in 24 hours from cardiac paralysis.

SYMPTOMS:

Metallic taste in mouth; violent vomiting of mucus, bile, watery fluid, or blood; purging of intestinal contents, then mucus, bile, and perhaps blood, followed soon by **rice water stools**; pulse imperceptible; respiration shallow; face pinched, livid, and covered by cold sweat; cramps in legs; pain and burning in stomach; difficulty in swallowing; great thirst; debility.

TREATMENT:

Put patient in horizontal position, head lower than feet.

The chemical antidotes are Tannic Acid, which forms the insoluble tannate (give 5 to 20 grains in a wineglassful of water), or Gallic Acid (same), infusion of oak bark, galls, etc., followed by white of egg. May give as an antidote Magnesium or Sodium Carbonate (2 to 4 tablespoonfuls in 4 to 8 ounces of water).

1. If patient has not vomited, syphon out stomach with stomach-tube, or tickle fauces with feather or finger to induce vomiting, or give Apomorphine Hydrochlorate, hypodermically (in $\frac{1}{10}$ grain doses). Give plenty of strong coffee or tea. After syphoning may lavage stomach with solution Tannin (10 to 30 grs. to pint of water). Avoid tube in Chloride.

2. **Give demulcents** (such as white of egg, milk, oil, gum arabic, flaxseed or elm tea, barley or starch water, oatmeal gruel, gelatin, flour and water, or even crushed bananas), to soothe and protect the irritated or inflamed surfaces.

3. **Employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body), to maintain bodily temperature. Mustard to epigastrium.

4. **Give Opium** (Powdered Opium, 1 to 2 grains every $\frac{1}{2}$ to 2 hours), or Laudanum (20 drops every $\frac{1}{2}$ to 2 hours by mouth, or half a teaspoonful in gruel by rectum as frequently), or Morphine Sulphate ($\frac{1}{4}$ grain by mouth or hypodermically every $\frac{1}{2}$ to 2 hours), to relieve pain and nervous irritability.

5. **Stimulate heart, circulation, and respiration** with Brandy or Whisky (2 teaspoonful doses every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($\frac{1}{60}$ to $\frac{1}{20}$ grain hypodermically every $\frac{1}{2}$ to 2 hours) and Atropine Sulphate ($\frac{1}{120}$ grain hypodermically every $\frac{1}{2}$ to 2 hours), or Tincture of Belladonna (20 drops in water every $\frac{1}{2}$ to 2 hours). Tincture of Digitalis (15 to 30 drops by mouth, or half as much hypodermically, every $\frac{1}{2}$ to 2 hours), or Digitalin ($\frac{1}{100}$ grain hypodermically every $\frac{1}{4}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary), may be used for the same purposes. Draughts of strong coffee may also be given.

ANTIPYRINE.

(See Acetanilid).



APPEARANCE
OF STOMACH
IN POISONING BY
ARSENIC
(BRUNDAGE)

See pages 97, 308

ARSENIC: ARSENOUS ACID — ARSENICAL FLY PAPER — COBALT SALTS — DONOVAN'S SOLUTION — FLY STONE — FOWLER'S SOLUTION — RAT PASTE — "ROUGH ON RATS" — PARIS GREEN (ACETO—ARSENITE OF COPPER)—SCHEELE'S GREEN (ARSENITE OF COPPER)—POISONOUS INSECT POWDER — ETC. (See colored plate.)

HISTORY:

Arsenic in one form or another is quite a common poison, has almost no taste and is therefore easily given. Poisoning occurs by intent, also from grinding Arsenic in mills, from vapor in smelting copper, from handling or manufacturing certain wall papers, etc., and from various uses in the arts. It is a constituent of various insecticides and used to destroy vermin, various weeds, and in stuffing birds and animals; also for various preservative purposes, to improve the coats of horses, and by dentists in destroying nerves in teeth. Has been taken by mistake for "Salts" or Magnesia. Arsenic with Phosphorus and ground glass is said to be a constituent of a certain rat poison. (Some vermin killers contain Strychnine; some Corrosive Sublimate.) External applications of arsenic may inflame stomach and intestines and kill.

Fatal Dose: Usually a dose of 3 grains of Arsenic is fatal, but recovery is quite probable when only 1 grain has been taken, also when a large dose produces prompt and copious vomiting. Death from 2 grains White Arsenic; also from $\frac{1}{2}$ ounce Fowler's Solution.

Death usually occurs within 24 hours. May occur in 20 minutes, or not for two weeks.

SYMPTOMS:

Burning pain in the esophagus and stomach; pain in stomach is increased by pressure, soon spreads over abdomen; there is frontal headache;

colicky pains; sense of constriction in throat, and irritating metallic taste in mouth; more or less violent, often bloody vomiting and purging; rejected matters, first mucus, then bilious, of a yellowish, brownish, or greenish color; stools may become serous or bloody; pulse is small, feeble, and frequent; breathing difficult and rapid; great thirst; urine suppressed; face swollen; extremities very cold; cramps in calves; cyanosis, followed by cramps; convulsions; coma; death. Nettle-rash-like, papular, vesicular or pustular skin eruption in protracted cases. [Symptoms appear in $\frac{1}{2}$ to 3 hours.]

TREATMENT:

1. Syphon out stomach with stomach-tube if patient is seen soon after taking poison; if not, give Mustard (a tablespoonful in a wineglassful of water), or Zinc Sulphate (20 grains in 2 tablespoonfuls of water every 15 minutes if necessary), or Cupric Sulphate (3 to 5 grains in a wineglassful of water every 5 to 10 minutes until vomiting results), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results); or give a hypodermic injection of Apomorphine Hydrochlorate ($\frac{1}{10}$ grain repeated every 15 minutes until effective). Give hot milk before or during evacuation.

The chemical antidote should be given before or when evacuating the stomach; also evacuate after it.

The chemical antidote is Hydrated Sesquioxide of Iron. In an emergency this may be prepared by adding an excess of weak Aqua Ammonia to diluted Tincture of the Chloride of Iron, and frequently and freely giving the precipitate after washing the same with water; or Monsell's Solution, Dialyzed Iron, or Magnesia in water, may be used, in place of the Tincture of Iron. (See Iron in Part I).

Ferri Oxidum Hydratum cum Magnesia—the official antidote—made by precipitating solution of Tersulphate of Iron by Magnesia, is usually considered

best antidote. Give often in $\frac{1}{2}$ oz. doses or more. Or give: Tr. Chloride of Iron 2 oz.; Water 2 pints; Magnesia to excess, in 4 doses 15-30 min. apart. May give Dialysed Iron (3 $\frac{1}{2}$ -6 followed by salt 3 r, every $\frac{1}{4}$ to 4 hrs.) **Follow any Iron antidote by $\frac{1}{2}$ oz. Castor Oil.**

If no other antidotes, may use freely raw eggs beaten up in milk with Magnesia; also sugar in milk, which forms insoluble compound with Arsenous Acid.

2. **Give demulcents** (such as white of egg, milk, oil, gum arabic, flaxseed or elm tea, barley or starch water, oatmeal gruel, gelatin, flour and water, or even crushed bananas), to soothe and protect the irritated or inflamed surfaces. Also give alkaline mineral waters:

3. **Give Opium** (Powdered Opium, 1 or 2 grs. every $\frac{1}{2}$ to 2 hours), or Laudanum (10 to 20 drops every $\frac{1}{2}$ to 2 hours by mouth, or $\frac{1}{2}$ teaspoonful in gruel by rectum as frequently), or Morphine Sulphate ($\frac{1}{4}$ grain by mouth or hypodermically every $\frac{1}{2}$ to 2 hours), to relieve pain and nervous irritability.

4. **Stimulate heart, circulation, and respiration** with Brandy or Whisky (2 teaspoonful doses every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($\frac{1}{60}$ to $\frac{1}{20}$ grain hypodermically every $\frac{1}{2}$ to 2 hours) and Atropine Sulphate ($\frac{1}{120}$ grain hypodermically every $\frac{1}{2}$ to 2 hours), or Tincture of Belladonna (20 drops in water every $\frac{1}{2}$ to 2 hours), to prevent collapse. Tincture of Digitalis (15 to 30 drops by mouth, or half as much hypodermically, every $\frac{1}{2}$ to 2 hours), or Digitalin ($\frac{1}{100}$ grain hypodermically every $\frac{1}{4}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary), may be used for the same purpose. Draughts of strong coffee may also be given.

5. **Employ artificial heat** (such as hot water

bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body), to maintain bodily temperature. Also poultices over stomach.

6. Give large draughts of water containing Sweet Spirit of Nitre (2 to 4 teaspoonfuls), to relieve the tendency to suppression of urine.

ATROPINE.

(See Belladonna).

AUTO-INTOXICATION, OR AUTO-INFECT- TION (SELF-POISONING).

HISTORY:

Auto-infection is perhaps best defined to be the result of an unnatural general metabolism or of an unnatural decomposition in the digestive tract.

It seems probable that there are substances in the excretions of all plants and animals, which are poisonous to them. If we drank none but the purest water and took only that food which was absolutely void of adulteration and infection, and respired only pure air, yet our excretions would undoubtedly contain poisons.

The bacteria which are always present in the natural contents of the intestines doubtless originate some of these poisons, which are truly ptomaines.

Constipation interferes with elimination and as a natural consequence a more or less serious train of symptoms frequently results.

SYMPTOMS:

The common symptoms are: more or less headache; coated tongue; offensive breath; sense of stupor and languor; etc.

TREATMENT:

A brisk cathartic, followed by a bitter tonic, and a temporary reduction in the nitrogenous foods is usually all that is required.

**BARIUM AND ITS COMPOUNDS: BARIUM
ACETATE — BARIUM CHLORIDE —
BARIUM NITRATE — BARIUM OXIDE
(BARYTA)—ETC.**

HISTORY:

Barium Chloride is sometimes mistaken for Epsom Salt. Barium Nitrate has been mistaken for Sulphur.

Fatal dose: Death has resulted from 100 grains of Barium Chloride in 15 hours; death has resulted from a drachm of Barium Carbonate; half an ounce of Barium Chloride has been fatal in 2 hours; half an ounce of the Nitrate of Baryta killed a man in $6\frac{1}{2}$ hours.

SYMPTOMS:

Abdominal pains; cramps; purging; vomiting; feeble pulse; labored and short respiration; dilated pupils; excessive urination; loss of voice, sight or hearing; convulsions; collapse; death.

TREATMENT:

1. **Evacuate the stomach;** syphon out the stomach with a stomach-tube, or give Mustard (a tablespoonful in a wineglassful of water), or Zinc Sulphate (20 grains in $\frac{1}{2}$ wineglassful of water), or inject Apomorphine Hydrochlorate, hypodermically ($\frac{1}{10}$ grain). Repeat in 15 minutes if necessary.

As an antidote, give Dilute Sulphuric Acid ($\frac{1}{2}$ to 1 teaspoonful in a wineglassful of water), or give Aromatic Sulphuric Acid (same amount), or **Magnesium or Sodium Sulphate** ($\frac{1}{2}$ to 1 ounce, or 1 to 2 tablespoonfuls, in a cupful of water, or all three may be given together in much water. The purpose in such treatment is to produce the insoluble Barium Sulphate. May give Pulverized Alum (1 drachm in $\frac{1}{2}$ cupful of water). Again wash out stomach.

2. **Give demulcents** (such as white of egg, milk, oil, gum arabic, flaxseed or elm tea, barley or starch water, oatmeal gruel, gelatin, flour and water, or

even crushed bananas), to soothe and protect the irritated and inflamed surfaces.

3. **Stimulate**, if there are signs of collapse, with Brandy or Whisky (2 teaspoonful doses every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($\frac{1}{60}$ to $\frac{1}{20}$ grain hypodermically every $\frac{1}{2}$ to 2 hours) and Atropine Sulphate ($\frac{1}{120}$ grain hypodermically every $\frac{1}{2}$ to 2 hours), or Tincture of Belladonna (20 drops in water every $\frac{1}{2}$ to 2 hours), to prevent collapse. Tincture of Digitalis (15 to 30 drops by mouth, or half as much hypodermically, every $\frac{1}{2}$ to 2 hours), or Digitalin ($\frac{1}{100}$ grain hypodermically every $\frac{1}{4}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary), may be used for the same purposes. Draughts of strong coffee may also be given.

4. **Give Opium** (Powdered Opium, 1 or 2 grains every $\frac{1}{2}$ to 2 hours), or Laudanum (20 drops every $\frac{1}{2}$ to 2 hours by mouth, or $\frac{1}{2}$ teaspoonful in gruel by rectum as frequently) or Morphine Sulphate ($\frac{1}{4}$ grain by mouth or hypodermically every $\frac{1}{2}$ to 2 hours), to relieve pain and nervous irritability.

5. **Apply poultices**, mustard paste or hot water bag, or cloths wrung out in hot water to abdomen.

BELLADONNA (DEADLY NIGHT SHADE)
 —ATROPINE—HOMATROPINE—HY-
 OSCYAMUS—HYOSCYAMINE—HYOS-
 CINE—STRAMONIUM—DATURINE—
 DULCAMARA—SOLANINE—DUBOI-
 SIA, ETC.

HISTORY:

Belladonna: Belladonna berries are sometimes eaten by mistake. Infusion of leaves, and extract

have also been taken for other substances. The plaster has poisoned by application. Hyoscyamus has been eaten for parsnips by mistake. The seeds have likewise been accidentally mixed with celery seeds and used in cooking. The tincture has been mistaken for black draught. Stramonium has been used to intoxicate and for murder, in which case it is sometimes mixed with sugar, tobacco or flour. An infusion of the leaves has been accidentally taken for an herb tea, and children have been poisoned by eating the seeds. Extract of Stramonium has been accidentally substituted for an extract of Sarsaparilla. Atropine, etc., externally, poison.

The prognosis usually is good.

Fatal dose: Death from Atropine poisoning usually takes place within 6 hours, and if life is prolonged to 8 hours, recovery is very probable. Most cases recover under treatment. Death has resulted from a drachm of the Belladonna Liniment, and recovery has occurred from $\frac{1}{2}$ an ounce. Fatal results from a few ripe berries; recovery after eating 50 berries. Death from Extract of Belladonna 1 drachm in $2\frac{3}{4}$ hours; also recovery from 3 drachms of it. Children will take almost as much as adults, as a rule. 100 Stramonium seeds killed a 2-year-old child. Death from $\frac{1}{30}$ grain Atropine subcutaneously; also from $\frac{1}{12}$ grain by mouth, and death is likely when 1 grain has been taken and no treatment follows. Recovery from 5 gr. Sulphate. Death from $\frac{1}{8}$ oz. Tincture. Death may occur in 1 or 2 hours; usually within 15 hours. Death by cardiac paralysis.

SYMPTOMS:

Heat and dryness in mouth and throat; great thirst, which nothing allays; greatly dilated pupils; indistinct and double vision; giddiness; dry skin, perhaps scarlatinal kind of rash; nausea; vomiting; stupor following delirium; may be excitement, wild talk, laughter and fanciful delusions; rapid pulse; convulsions; coma; death. Sometimes desire but

inability to urinate. Face sometimes red and swollen. The symptoms usually appear in from $\frac{1}{2}$ to 2 hours after taking the poison.

TREATMENT:

Before syphoning out the stomach or giving an emetic, give Tannic Acid or Gallic Acid (20 grains in a wineglassful of water, immediately followed by another glassful of water) as an antidote to the poison. Charcoal or a strong decoction of oak bark or tea may be given instead. If none of these are at hand, give a mixture of Iodine 1 grain, Potassium Iodide 10 grains, in a wineglassful of water. Empty the stomach in 5 or 10 min.

1. **Evacuate the stomach**; syphon out the stomach with a stomach-tube, using much water; or give Mustard (1 tablespoonful in a small cupful of water, repeated in 10 to 20 minutes if necessary), or Zinc Sulphate (20 grains in half a wineglassful of water, repeated in 10 to 20 minutes if necessary), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($\frac{1}{10}$ grain, repeated in 10 to 20 minutes if necessary). Follow with Sweet Spirit of Nitre (in teaspoonful doses), or **Pilocarpine Nitrate**, the most perfect antagonist ($\frac{1}{4}$ grain), to encourage elimination of the poison. Atropine dries, Pilocarpine moistens the skin; Atropine accelerates the respiration, Pilocarpine slows it.

2. **Give Opium** (Powdered Opium, in 1 to 2 grain doses every $\frac{1}{2}$ to 2 hours), or Laudanum (15 to 20 drops every $\frac{1}{2}$ to 2 hours), or Morphine Sulphate (in $\frac{1}{4}$ to $\frac{1}{2}$ grain doses hypodermically every $\frac{1}{2}$ to 2 hours), or Eserine (in $\frac{1}{60}$ to $\frac{1}{30}$ grain doses every $\frac{1}{2}$ to 2 hours), to quiet the brain. **Morphine** is the best antagonist to the effects of Atropine on the cerebrum, kidneys, heart, pupils, respiration and arterial tension. **Muscarine** is probably the best general antagonist (in doses of $\frac{1}{8}$ to 1 grain).

3. **Draw the urine.**

4. **Employ heat;** hot water to the feet, and hot bricks, bottles, or water bags to the body. Apply a mustard paste to the feet and over the heart.

Arouse by alternate hot and cold douches to chest. Apply cold to head. Give Chloral for Hyoscine delirium.

5. **Stimulate.** Give 15 to 30 drop doses of Aromatic Spirit of Ammonia, and Brandy or Whisky (a teaspoonful in water by mouth, or $\frac{1}{4}$ teaspoonful hypodermically every $\frac{1}{4}$ to 1 hour). Hold Ammonia Water to the nostrils. Give strong coffee.

6. **Employ artificial respiration if respiration is interfered with** (rhythmically raise and lower arms from sides to up over head and back again, 18 to 20 times per minute).

BENZENE — BENZOL.

HISTORY:

Used in dyeing, cleaning and as a cough medicine. Death in 17 hours from 3 drachms of Benzene.

SYMPTOMS:

Nausea; gastro-intestinal distress; dizziness.

TREATMENT:

1. **When swallowed, evacuate the stomach;** syphon out the stomach with a stomach-tube, or give Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Zinc Sulphate (20 grains in two tablespoonfuls of water, repeated in 15 minutes if vomiting is not produced), or Apomorphine Hydrochlorate ($\frac{1}{10}$ grain hypodermically, repeated every 15 minutes until effective). After giving an emetic give plenty of luke-warm water to encourage vomiting. Sodium or Potassium Carbonate or Bicarbonate may be administered as an antidote.

1. **When inhaled, provide much fresh air.** Artificial respiration should be resorted to if necessary

(rhythmically raise arms, extended at sides, to up over head and back again, 18 times a minute).

Give Atropine Sulphate (in $1/120$ to $1/60$ grain doses hypodermically every $1/2$ to 2 hours), or **Tincture of Belladonna** (15 to 30 drops every $1/2$ to 2 hours by mouth), to overcome depression.

Douche the chest with hot and cold water alternated; to arouse.

Use interrupted electric current over heart to support heart and circulation.

Give Ammonia or steam inhalations.

BENZINE.

(See Petroleum).

BISMUTH.

(Treat as for Arsenic, etc.)

BLOOD ROOT.

(See Sanguinaria).

BROMIDES.

SYMPTOMS:

Nervous system greatly depressed; force and frequency of heart beat much lessened; reduction in temperature, and in number of respirations; muscular weakness, semi-somnolent state or maniacal excitement.

(Bromides are eliminated by the kidneys, skin, saliva, bronchial and intestinal mucous membranes, and in milk).

TREATMENT:

1. **Evacuate the stomach:** syphon out the stomach with a stomach-tube, using plenty of water. If stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in two tablespoonfuls of water, repeated in 15 minutes if vomiting is not produced), or Cupric Sulphate (3 to 5 grains in 2 tablespoonfuls of water every 5 to 10 minutes until it acts), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effec-

tive), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($1/10$ grain, repeated every 15 minutes until effective). After giving emetic, always give plenty of luke-warm water to encourage vomiting.

2. **Give Opium** (Powdered Opium in 1 to 2 grain doses every 1 to 3 hours), or Morphine Sulphate (in $1/4$ grain doses every 1 to 3 hours by mouth or hypodermically) to combat mental symptoms.

3. **Support and stimulate.** Give Caffein Citrate (in 1 to 5 grain doses every $1/2$ to 2 hours) to combat depression. Administer Tincture of Digitalis (in 10 to 20 drop doses every 1 to 3 hours) to sustain and regulate the heart. Fluid Extract of Ergot (in 15 minim doses every 1 to 3 hours), or Atropine Sulphate ($1/120$ to $1/60$ grain hypodermically every $1/2$ to 2 hours) or Tincture of Belladonna (in 10 to 20 drop doses) to stimulate heart, etc. Brandy or Whisky (in teaspoonful doses by mouth or $1/4$ teaspoonful hypodermically every $1/4$ to 1 hour) may be given with the Opium, as a nervous stimulant.

BROMINE.

HISTORY:

An ounce on an empty stomach caused death in 7 hours.

SYMPTOMS:

Inhaled, its vapor greatly irritates the respiratory mucous membrane and the eyes, causing distressing cough, hoarseness, and dyspnœa.

Swallowed, its action is that of an active corrosive poison. It causes violent gastritis, rapid prostration, great anxiety, rapid pulse, trembling of hands, collapse.

TREATMENT:

When Inhaled, provide fresh air; give **inhalations of Ammonia** or steam; stimulate by Aromatic Spirit of Ammonia ($\frac{1}{2}$ teaspoonful in wineglassful of water every $\frac{1}{2}$ to 2 hours). Give **Caffein Citrate** (in 1 to 5 grain doses every $\frac{1}{2}$ to 2 hours). Irritation to bronchi relieved by chloroform inhalations.

1. **When Swallowed**, evacuate the stomach: syphon out the stomach with a stomach-tube, or produce vomiting by Apomorphine Hydrochlorate (hypodermically in $\frac{1}{10}$ grain doses). Give Magnesia freely, or Potassium or Sodium Carbonate, or Bicarbonate (a teaspoonful in a wineglassful of water).

2. **Counteract depression** by giving a cupful of strong coffee, or Caffein Citrate (1 to 5 grain doses every $\frac{1}{2}$ to 2 hours).

3. **Give demulcents** (such as white of egg, milk, flaxseed or elm tea, barley or starch water, oatmeal gruel, gelatin, flour and water, or even crushed bananas) to soothe and protect the irritated or inflamed surfaces.

BRUCINE.

(See Strychnine.)

BRYONIA.

• (See Aloes).

CAFFEINE.**HISTORY:**

Recovery after 200 grains.

SYMPTOMS:

Burning pain in throat; giddiness; faintness; nausea; numbness; pain in abdomen; dry tongue; great thirst; trembling of extremities; free diuresis; cold skin; weak pulse; collapse.

TREATMENT:

1. **Evacuate the stomach:** syphon out the stomach with a stomach-tube, using plenty of water. If stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in two tablespoonfuls of water, repeated in 15 minutes if vomiting is not produced), or Cupric Sulphate (3 to 5 grains in 2 tablespoonfuls of water every 5 to 10 minutes until it acts), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha 30 grains, or Syrup of Ipecac a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($1/10$ grain, repeated every 15 minutes until effective). After giving emetic, always give plenty of luke-warm water to encourage vomiting.

2. **Stimulate heart, circulation, and respiration,** with Brandy or Whisky (in 2 teaspoonful doses every 10 to 15 minutes, or $1/4$ teaspoonful doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $1/4$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($1/60$ to $1/20$ grain hypodermically every $1/2$ to 2 hours) and Atropine Sulphate ($1/120$ grain hypodermically every $1/2$ to 2 hours), or Tincture of Belladonna (20 drops in water every $1/2$ to 2 hours). Morphine Sulphate hypodermically (in $1/4$ grain doses every $1/4$ to 2 hours) often helps. Digitalin ($1/100$ grain hypodermically every $1/4$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $1/4$ to 1 hour if necessary) may also be found useful. Resort to faradization or galvanization of respiratory muscles if required.

3. **Employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates or stove-lids heated,

applied to the feet and sides of the body) to maintain bodily temperature.

CALABAR BEAN (PHYSOSTIGMA, THE WESTERN AFRICA ORDEAL BEAN) — PHYSOSTIGMINE (ESERINE).

HISTORY:

Poisoning occurs from beans eaten by children.

The bean is used in decoction by the natives of the west coast of Africa as the ordeal test for witchcraft. They believe the innocent will vomit it, the guilty retain it and die.

Fatal dose: Six beans caused death in boy of 6 years. The fatal dose of Physostigmine is considerably less than 3 grains.

Death results from respiratory paralysis.

SYMPTOMS:

Effects are opposite to those produced by Strychnine.

Tumultuous heart action; complete muscular relaxation and tremors; giddiness; contracted pupils; respiration irregular and slow; reflexes lost; may be vomiting and purging.

TREATMENT:

1. **Evacuate the stomach** with stomach-tube, using plenty of water. If stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 15 minutes if vomiting is not produced), or Cupric Sulphate (3 to 5 grains in 2 tablespoonfuls of water every 5 to 10 minutes until it acts), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or, best of all the emetics, Apomorphine Hydrochlorate, hypodermically (1/10

grain, repeated every 15 minutes until effective). After giving emetic, always give plenty of lukewarm water to encourage vomiting.

Potassium Permanganate (10 grains in 1 pint of water) introduced into stomach by stomach-tube and repeated in half an hour has been highly recommended.

Give Tannic Acid (30 grains in $\frac{1}{2}$ cupful of water) or draughts of strong tea. **Give Spirit of Nitrous Ether** (1 teaspoonful, repeated every $\frac{1}{2}$ to 2 hours). If urine is suppressed, use Catheter.

2. **Atropine is the best physiological antidote** (antagonist). Give Atropine Sulphate ($\frac{1}{120}$ to $\frac{1}{60}$ grain hypodermically every $\frac{1}{4}$ to 2 hours for 4 doses, or until the pulse is quickened, or until the pupils dilate), or Tincture of Belladonna (10 to 20 drops in water by mouth or rectum every $\frac{1}{4}$ to 2 hours, as preceding). If this treatment is ineffective, give Chloral (in 10 grain doses every $\frac{1}{4}$ to 1 hour in syrup and water by mouth, or in water by rectum). Give Strychnine Nitrate, hypodermically ($\frac{1}{60}$ to $\frac{1}{20}$ grain every $\frac{1}{2}$ to 2 hours), or Tincture of Nux Vomica (10 to 20 drops).

3. **Stimulate:** Give Brandy or Whisky (in teaspoonful doses every 15 to 30 minutes), or Alcohol ($\frac{1}{2}$ teaspoonful in tablespoonful of water every 15 to 30 minutes). Coffee may be beneficial.

4. **Artificial Respiration.**—If respiration becomes labored, raise patient's stretched out arms, rhythmically, from sides of body to up over head, and back to sides again, 20 times a minute, with tongue kept forward.

CALCIUM.

(See Lime, also Alkalies).

CAMPBOR.—CAMPBORATED OIL.— SPIRIT OF CAMPBOR.

HISTORY:

A popular household remedy, occasionally taken by mistake. May cause very severe symptoms but

rarely fatal. (Spirit of Camphor is 1 to 10; Camphorated Oil 1 to 5 in strength.)

Fatal dose: 30 grains or more. Recovery after 200 grains. Dangerous symptoms from 20 grains and from 15 minims of the strong solution. Death by asphyxia.

SYMPTOMS:

Camphor odor; languor; giddiness; clammy skin; headache; smarting in urinary organs; pulse quick and weak; delirium; convulsions; collapse. No purging, vomiting or pain, unless dose very large, when may be burning pain along esophagus and at pit of stomach, and vomiting.

TREATMENT:

1. Promptly give water to precipitate the Camphor, if in alcoholic solution.

2. **Evacuate the stomach;** syphon out the stomach with a stomach-tube, using plenty of water. If stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 15 minutes if vomiting is not produced), or Cupric Sulphate (3 to 5 grains in 2 tablespoonfuls of water every 10 to 15 minutes until it acts), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Syrup of Ipecac (a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically (1/10 grain, repeated every 15 minutes until effective). After giving emetic always give plenty of luke-warm water to encourage vomiting.

After emptying stomach give saline purgatives freely.—Some authorities favor giving Castor Oil and Alcohol or Brandy by mouth; others consider these aid in the solution and absorption of the Camphor. If give Alcohol or Brandy, it is better to give it hypodermically.

3. Allow patient to inhale Ether to check inclination to convulsions. Relieve cramps with

alternate hot and cold douches. May give Aconite (Tincture of Aconite, 1 drop every 1 to 2 hours), Potassium Bromide (in 10 grain doses every $\frac{1}{2}$ to 1 hour), or Opium (Powdered Opium 1 or 2 grains every $\frac{1}{2}$ to 2 hours), or Laudanum (20 drops in water every $\frac{1}{2}$ to 2 hours) to relieve the convulsions.

4. **Employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates or stove-lids, heated, applied to the feet and sides of the body) to maintain bodily temperature.

CANNABIS, AMERICAN (CANNABIS AMERICANA, AMERICAN HEMP)—CANNABIS, INDIAN (CANNABIS INDICA, INDIAN HEMP) — HASCHISCH — GUNJAH OR GANGA OR GANZA — CHURRUS OR CHARAS—BHANG OR SIDDHI.

SYMPTOMS:

Sense of exhilaration; pleasurable intoxication; peculiar prolongation of time; sense of double consciousness followed by drowsiness; anesthesia; loss of power, particularly of lower extremities; pupils dilated; pulse rapid; respiration slow; may cause increased sexual desire; catalepsy; sometimes convulsions.

TREATMENT:

Caustic Alkalies are incompatible.

1. **Evacuate the stomach;** syphon out the stomach with a stomach-tube, using plenty of water. If the stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipe-

cacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($1/10$ grain, repeated every 15 minutes until effective). After giving emetic, always give plenty of luke-warm water to encourage vomiting.

Give strong tea freely; or Tannic Acid, or Gallic Acid (30 grs. in $1/2$ wineglassful water). **Apply heat.**

Give Sweet Spirit of Niter (in teaspoonful doses every $1/4$ to 1 hour) to encourage excretion by kidneys. Give orange or lemon-juice to neutralize poison.

2. **Stimulate:** give draughts of strong coffee, or Caffein Citrate (in 2 or 3 grain doses every 1 to 3 hours), Atropine Sulphate (in $1/120$ grain doses hypodermically every 1 to 3 hours), or Tincture of Belladonna (10 to 15 drops every 15 minutes, for 2 or 3 doses) as antagonists; Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled) to stimulate circulation. If respiration is embarrassed, resort to artificial respiration. May apply electricity to the chest muscles. **Draw urine.**

CANTHARIDES (SPANISH FLIES) — CANTHARIDIN. (See p. 238.)

HISTORY:

The powder has been taken for jalap and for pepper. Also taken to produce abortion.

Fatal dose: 24 grains of the powder, 1 ounce of the Tincture. Recovery from 2 drachms also an ounce of the powder, and from 6 drachms also an ounce of the Tincture. Fatal period usually from 24 to 36 hours. Death by paralysis of respiratory centres.

SYMPTOMS:

A violent gastro-enteritis, with abdominal tenderness; burning sensation in pharynx and esophagus; sense of constriction of throat; burning pain in back, bladder, and urethra; frequently

great thirst; vomiting, the vomit containing shining particles of the powder; constant desire to pass water, but only blood or albuminous urine passed each time; priapism; sometimes sloughing of the genital organs; strangury; abortion; sometimes violent delirium and tetanic convulsions; coma.

TREATMENT:

There is no known chemical antidote.

1. **Evacuate the stomach:** syphon out the stomach with a stomach-tube, using plenty of water. If stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($1/10$ grain, repeated every 15 minutes until effective). After giving emetic, always give plenty of luke-warm water to encourage vomiting.

2. **Give demulcents** (such as white of an egg, barley, elm, flaxseed tea, or gruel). **Avoid oils or any oily emulsion, as Cantharidin is soluble in such.**

3. **Give Opium** (Powdered Opium, 1 to 2 grains every $1/2$ to 2 hours; or Laudanum, 20 drops every $1/2$ to 2 hours by mouth, or $1/2$ teaspoonful in gruel by rectum as frequently), or Morphine Sulphate ($1/4$ grain by mouth, or hypodermically every $1/2$ to 2 hours) to relieve pain and irritation.

4. **Stimulate heart, circulation, and respiration** with Brandy or Whisky (2 teaspoonful doses every 10 to 15 minutes, or $1/4$ teaspoonful doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $1/4$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate

(1/60 grain hypodermically every $\frac{1}{2}$ to 2 hours) and Atropine Sulphate (1/120 grain hypodermically every $\frac{1}{2}$ to 2 hours), or Tincture of Belladonna (20 drops every $\frac{1}{2}$ to 2 hours), or Tincture of Digitalis (15 to 30 drops by mouth, or half as much hypodermically every $\frac{1}{2}$ to 2 hours), or Digitalin (1/100 grain hypodermically every $\frac{1}{4}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour) and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary) may be used for the same purposes. Draughts of strong coffee may also be given. Finally, give alkaline diuretics.

5. **Employ artificial heat** (either hot water bottles, ordinary bottles of hot water, bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body) to maintain bodily temperature.

Poultices to abdomen; anesthetics for convulsions.

Wash out bladder with warm water for severe irritation of it.

CARBON MONOXIDE (CARBONIC OXIDE) —CHARCOAL FUMES—ETC.

HISTORY:

A combustible, colorless, transparent, odorless, tasteless, very poisonous gas. Burns readily in air with blue flame. When cast-iron plates are red hot it readily diffuses through them; thus the gas may pass into air of a room heated by a stove. Open charcoal or stove coal fires, defective stove-pipes or furnace flues and escaping illuminating gas are among its sources. It also collects in mines, pits, wells, etc.

This gas enters the blood, combining with the hemoglobin of the red corpuscles and displacing the oxygen. After the blood has been saturated with this gas recovery is almost impossible. The blood of those poisoned by this gas is of a persistent fluidity and bright, cherry red. Air containing 1 per cent. of this gas will kill a dog in a minute and

a half. The gas is a narcotic poison. When patient has been exposed to gas over 8 hours and coma exists, the chances of recovery are slight. If opposite exists, may expect recovery. Other things being equal, the chances of recovery or permanence of injury is in proportion to the length of time the blood has been exposed to the gas and the degree of saturation with the gas.

Carbon monoxide is chief constituent of coal gas and poisoning by latter mainly due to it. But **suffocation** by coal gas not to be confused with **poisonous** effects of coal gas. "Water gas" contains about 30% carbon monoxide.

SYMPTOMS:

In Poisoning:—

Dizziness; severe headache; weakness; may be nausea, vomiting and convulsions; face, as a rule, livid; pupils dilated. When the poisoning is very slow, the symptoms are languor, debility, anorexia, headache, and maybe a dry cough. Symptoms resemble those of malaria.

In Suffocation:—

Symptoms are choking; gasping; suffused eyes; congested face; collapse.

TREATMENT:

1. Promptly provide plenty of fresh air. Make cold wet applications to the head and neck.

Employ artificial respiration if necessary (by rhythmically raising and lowering arms from extended at sides to up over head and back again, 18 or 20 times per minute).

2. Give Oxygen, also Ammonia inhalations.

3. Douche face and chest with hot and cold water, alternated. Apply heat to the feet and body.

4. Stimulate heart, circulation, and respiration with Brandy or Whisky (2 teaspoonful doses by mouth, or $\frac{1}{4}$ teaspoonful hypodermically every 10 to 15 minutes), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15

minutes, or $\frac{1}{4}$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($\frac{1}{60}$ to $\frac{1}{20}$ grain hypodermically every $\frac{1}{4}$ to 2 hours), and Atropine Sulphate ($\frac{1}{120}$ to $\frac{1}{60}$ grain hypodermically every $\frac{1}{2}$ to 2 hours). Tincture of Digitalis (15 to 30 drops by mouth, or half as much hypodermically, every $\frac{1}{2}$ to 2 hours), or Digitalin ($\frac{1}{100}$ grain hypodermically every $\frac{1}{4}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary), may also be employed for the same purposes. Draughts of strong coffee or rectal injections of coffee may be given.

Give lime water, milk or flour mixed in water. May advantageously give Camphor (2 grains dissolved in almond oil), every 2 to 4 hrs., as required, or camphorated oil Mxv hypodermically.

5. **Transfusion of blood** has been recommended; also rectal or intravenous injection sterilized salt solution (1 heaping teaspoonful salt in 1 quart boiling water). Inject at 110° F. in flank, back, arm or abdomen.

CASTOR OIL BEANS.

HISTORY:

The activity of the plant is supposed to be due to Ricin, a poisonous toxalbumin from the seed of the castor oil plant. Ricinin is a crystallizable alkaloid from the plant.

Fatal dose: 3 seeds were fatal to an adult male in 46 hours; 20 seeds killed an adult female in 5 days. Recovery from 30 seeds.

SYMPTOMS:

Abdominal pain; cramps; prostration; vomiting; intense thirst; severe griping, purging, and tenesmus; collapse.

TREATMENT:

1. **Evacuate the stomach:** siphon out the stomach with a stomach-tube, using plenty of water. If the stomach-tube is not at hand, use an emetic,

such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 15 minutes if vomiting is not produced); or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains, or Syrup of Ipecac, a teaspoonful every 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($\frac{1}{10}$ grain, repeated every 15 minutes until effective). After giving emetic, always give plenty of luke-warm water to encourage vomiting.

2. **Give demulcents** (such as white of egg, milk, oil, gum arabic, flaxseed or elm tea, barley or starch water, oatmeal gruel, gelatin, flour and water, or even crushed bananas) to soothe and protect the irritated and inflamed surfaces.

3. **Employ artificial heat** (such as hot water bottles, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body) to maintain bodily temperature.

4. **Give Opium** (Powdered Opium, 1 to 2 grains every $\frac{1}{2}$ to 2 hours; or Laudanum, 20 drops every $\frac{1}{2}$ to 2 hours by mouth, or $\frac{1}{2}$ teaspoonful in gruel by rectum as frequently), or Morphine Sulphate ($\frac{1}{4}$ grain by mouth or hypodermically every $\frac{1}{2}$ to 2 hours), to relieve pain, griping, and tenesmus.

CHERRY LAUREL WATER.

(See Acid Hydrocyanic).

CHLORAL.

HISTORY:

Quite frequently injudiciously used by the public to quiet nerves and induce sleep. Is sometimes used for suicidal purposes. In frequent doses it may accumulate and kill by paralyzing the heart. A dose should very rarely exceed 20 grains and should not be repeated as often as hourly more than 3 times. It appears to be a cumulative poi-

son. 10 grains have caused alarming symptoms, 20 and 30 grains have each caused death; but as much as 460 grains have been recovered from, and it is believed that most persons would recover from any dose under 2 drachms if proper treatment were given. 3 grains killed a child, a year old, in 10 hours. In some persons large doses temporarily suspend some of the mental faculties without producing apparent unconsciousness. Children bear Chloral proportionately better than adults. Old persons, and particularly those with weak hearts or inclined to apoplexy, are easily affected. Death in $\frac{1}{6}$ to 40 hrs.

SYMPTOMS:

Loss of muscular power, followed by sleep and coma; respiration slow, shallow, feeble, labored; pulse weak, first slow, then rapid and thready; face white, livid, covered with cold sweat; pupils contracted during sleep, dilated upon awakening; body-temperature greatly reduced. May be delirium.

TREATMENT:

Put in horizontal position and elevate feet.

1. **Evacuate the stomach:** syphon out the stomach with a stomach-tube; or give Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Zinc Sulphate (in 20 grain doses every 10 to 15 minutes), or Apomorphine Hydrochlorate, hypodermically (in $\frac{1}{10}$ grain doses every 10 to 15 minutes, until vomiting results), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes, until vomiting is produced). After giving an emetic, always give plenty of luke-warm water to encourage vomiting.

Liquor Potassae (2 teaspoonfuls in a cupful of water is said to decompose 20 grains of Chloral in the blood); drachms $\frac{1}{2}$ to 2 should be given hourly as required.

2. **Stimulate:** give draughts of strong coffee by mouth, or introduce 1 pt. into rectum through tube;

or give Citrate Caffein (in 5 to 10 grain doses every $\frac{1}{2}$ to 3 hours). Give Strychnine Sulphate, hypodermically (in $\frac{1}{60}$ grain doses every $\frac{1}{4}$ to 2 hours); or give Picrotoxin (in $\frac{1}{100}$ to $\frac{1}{50}$ grain doses, repeated every $\frac{1}{4}$ to 2 hours to stimulate respiration. Also encourage heart action with inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief, using one every $\frac{1}{4}$ to 1 hour if necessary), and Brandy or Whisky, hypodermically ($\frac{1}{4}$ teaspoonful every 10 to 15 minutes). Keep patient awake, overcoming stupor by shaking, shouting, flagellation, or by shocks of electricity.

Give inhalations of oxygen.

3. **Employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of body) to maintain bodily temperature. This is very important.

Apply cold to head, and Ammonia to nostrils. Resort to artificial respiration, upon respiration becoming more labored.

CHLORATE OF POTASH (See Potassium Chlorate).

CHLORINE — CHLORINATED LIME — JAVELLE WATER — LABARRAQUE'S SOLUTION.

SYMPTOMS:

Chlorine **inhaled** causes extreme laryngeal irritation, and may even cause œdema, resulting in asphyxia. Black eschars on the tongue and pharynx may be produced. There is usually cough, a sense of tightness across the chest, and inability to swallow.

If a poisonous dose of these substances be **swallowed**, a sense of heat and burning results, and perforations of the esophagus and stomach may be produced.

TREATMENT:

When Chlorine vapor has been **inhaled**, the patient should inhale Ammonia vapor to form Ammonium Chloride. Provide much fresh air, steam inhalations, or inhalations of Ether or Chloroform. When Chlorine preparations have been taken into the stomach, albumin is the proper antidote.

1. **Evacuate the stomach.** When Chlorine preparations have been **swallowed**, the stomach should be gently washed out by means of a stomach-tube, or use an emetic, such as Zinc Sulphate (20 grains in two tablespoonfuls of water, repeated in 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($\frac{1}{10}$ grain, repeated every 15 minutes until effective). After giving emetic, always give plenty of luke-warm water to encourage vomiting.

2. **Give Ammonia Water** ($\frac{1}{4}$ teaspoonful in a wineglassful of water, repeated in 10 to 30 minutes), or give Aromatic Spirit of Ammonia (in teaspoonful doses, in a wineglassful of water, every 10 to 15 minutes).

3. **May also stimulate heart, circulation, and respiration** with Brandy or Whisky (2 teaspoonful doses every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful doses hypodermically as frequently), also with Strychnine Sulphate ($\frac{1}{60}$ grain hypodermically every $\frac{1}{2}$ to 2 hours) and Atropine Sulphate ($\frac{1}{120}$ grain hypodermically every $\frac{1}{2}$ to 2 hours), or Tincture of Belladonna (20 drops every $\frac{1}{2}$ to 2 hours). Tincture of Digitalis (15 to 30 drops by mouth, or half as much hypodermically every $\frac{1}{2}$ to 2 hours), or Digitalin ($\frac{1}{100}$ grain hypodermically every $\frac{1}{4}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour), and inhalations of Amyl Nitrite (a

3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary) may be used for the same purposes. Draughts of strong coffee may also be given. Give lime water, milk, or flour mixed in water.

4. **Give raw white of egg as the antidote.** May give other demulcents (such as flaxseed or elm tea, barley or starch water, oil, gum arabic, oatmeal gruel, gelatin, or even crushed bananas), to soothe and protect the irritated or inflamed surfaces.

Give Sodium Thiosulphate (20 grains in $\frac{1}{2}$ wine-glassful of water).

5. **Give Opium** (Powdered Opium, 1 to 2 grains every $\frac{1}{2}$ to 2 hours; or Laudanum, 20 drops every $\frac{1}{2}$ to 2 hours by mouth, or $\frac{1}{2}$ teaspoonful in gruel by rectum as frequently), or Morphine Sulphate ($\frac{1}{4}$ grain by mouth or hypodermically every $\frac{1}{2}$ to 2 hours), to relieve pain and restlessness.

CHLORODYNE.

HISTORY:

Irritant narcotic compound of Opium; probably Morphine Muriate, Chloroform, rectified Ether, Prussic Acid, Oil of Peppermint, Gum Acacia and Molasses.

Fatal dose: an ounce has caused death.

Treatment as in Opium poisoning.

CHLOROFORM.

(See Anesthetics).

CHOKER DAMP.

(See Acid Carbonic).

CHROMATE — BICHROMATE.

(See Acid Chromic).

COAL GAS.

(See Illuminating Gas).

COCAINE—EUCAINE.

HISTORY:

Cocaine has a twofold action—it acts upon the central and upon the peripheral nervous system. In small doses it excites the spinal cord and brain; in large ones it may produce convulsions and then paralysis. The peripheral action is manifested by the numbing of sensation.

Fatal dose: death is rare, but $\frac{1}{2}$ grain taken internally has caused death; 22 grains by mouth caused death within an hour; $\frac{7}{10}$ of a grain killed a child; 23 grains, also 32 grains, have been recovered from. Death from $1\frac{1}{2}$ gr. hypodermically also recovery from 14 grs.; $\frac{1}{20}$ gr. hypoderm. caused dangerous symptoms in girl 12 years old; $4\frac{1}{2}$ grains swallowed have produced very alarming symptoms. A solution applied to the eye or mucous membrane may produce suddenly serious symptoms; 7 or 8 minims of a 4 per cent. solution, in eye, have produced spasm and unconsciousness; 20 to 30 drops of a 4 per cent. solution applied to the teeth and gums have produced serious symptoms. Taken subcutaneously or applied to the mucous membrane Cocaine acts very rapidly. Death has occurred in 40 seconds and has been delayed also to 4 minutes. Recovery is quite certain after 30 minutes.

Death usually occurs from apnoea or heart failure.

SYMPTOMS:

The symptoms vary. As a rule, great nervous excitement, sense of oppression and fulness in head sometimes associated with nausea and vomiting. In beginning pulse and respiration may be more rapid but later they may be quite slow, and the breathing labored. The face may be cyanotic. The pupils are dilated and extremities cold. In fatal cases there is labored breathing, feeble, perhaps imperceptible, pulse, convulsions, coma and death. There may be early delirium and unconsciousness or almost no symptoms except those of asphyxia.

TREATMENT:

Fresh air. Put patient in horizontal position. Artificial respiration at once, if necessary.

Employ stimulants and electricity. Employ the following treatment as far as possible and required:

If Cocaine was introduced hypodermically, give stimulants of hot Brandy or Whisky (2 to 4 teaspoonfuls in water by mouth every 5 to 10 minutes, or more by rectum, or 15 to 30 minims hypodermically every 5 to 10 minutes). Also give inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled). Ammonia inhalations, or Aromatic Spirit of Ammonia (1 teaspoonful in water by mouth, or $\frac{1}{4}$ teaspoonful hypodermically every ten minutes), or Ether in 15 minim doses hypodermically, or more by rectum, often help; also Strychnine Sulphate ($\frac{1}{60}$ grain hypodermically), and Atropine Sulphate ($\frac{1}{120}$ to $\frac{1}{60}$ grain hypodermically), or Tincture of Belladonna (20 drops). Nitroglycerine (hypodermically in $\frac{1}{100}$ grain doses every $\frac{1}{4}$ to 2 hours) has been highly recommended. Chloroform or Chloral may be required for convulsions. Morphine Sulphate (in $\frac{1}{4}$ to $\frac{1}{2}$ grain doses) often is beneficial.

1. If the Cocaine was swallowed, evacuate the stomach if possible: syphon out the stomach with a stomach-tube, using plenty of water. If a stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water), or Mustard (a tablespoonful in a small cupful of water), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful), or Apomorphine Hydrochlorate, hypodermically ($\frac{1}{10}$ grain). After giving an emetic, always give plenty of luke-warm water, to encourage vomiting. Give Tannic Acid or Gallic Acid (30 grains in $\frac{1}{2}$ cupful of water). **Again in 10 minutes** wash out the stomach or empty it with an emetic. If the Tannic Acid is not at hand, give plenty of strong tea or decoction of oak bark (1 ounce to a small cupful of hot water); or

may give Iodine (1 grain) and Potassium Iodide (10 grains) in $\frac{1}{2}$ wineglassful of water. **Then use stomach-tube or emetic again.** Give inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour, if necessary) to support heart.

2. **Stimulate heart, circulation, and respiration** with Ammonia inhalations and with Brandy or Whisky (2 teaspoonful doses every 5 to 15 minutes, or $\frac{1}{4}$ teaspoonful doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 5 to 15 minutes, or $\frac{1}{4}$ teaspoonful hypodermically as frequently), and Atropine Sulphate ($\frac{1}{120}$ grain hypodermically), or Tincture of Belladonna (20 drops). To relieve impending collapse or paralysis of respiration, give Strychnine Sulphate ($\frac{1}{60}$ grain hypodermically every $\frac{1}{4}$ to 2 hours), or Tincture of Digitalis (15 to 30 drops by mouth, or half as much hypodermically), or Digitalin ($\frac{1}{100}$ grain hypodermically); the Strychnine may help the cerebral blood-vessels.

3. **Apply artificial heat to heart and body.** Apply sinapisms over heart, stomach and calves. Resort to friction of the extremities.

Oxygen inhalations for inclination to asphyxia.

4. **Artificial respiration if required** (rhythmically raising and lowering extended arms from sides to over head, 18 times a minute). Faradization or galvanization of respiratory muscles may be required.

5. **Give opium, if necessary.** To relieve nervous excitement or delirium, when present, give Morphine Sulphate, hypodermically (in $\frac{1}{4}$ to $\frac{1}{2}$ grain doses every $\frac{1}{4}$ to 2 hours), or Laudanum (20 drops every $\frac{1}{4}$ to 2 hours by mouth, or $\frac{1}{2}$ teaspoonful in gruel by rectum as frequently).

6. **Chloroform inhalations**, or Chloral (in 40 to 60 grain doses) may be required to relieve the convulsions. **Nitroglycerine**, hypodermically (in $\frac{1}{100}$ grain doses) has been recommended.

7. **Employ cathartic, enema, or both.**

COCCULUS INDICUS (LEVANT NUT, INDIAN BERRY, FISH BERRIES),—PICROTOXIN.

HISTORY:

Picrotoxin is used as a fish poison, as a bird poison, as a medicine, sometimes as a "knock-out" drops, and sometimes to adulterate beer. Beer extract containing Picrotoxin is fatal to flies. Picrotoxin poisoning produces an extraordinary swelling of the abdomen in frogs, which Strychnine does not.

SYMPTOMS:

Nausea; vomiting; muscular weakness; drowsiness; sometimes convulsions; may be scarlet-fever-like rash.

Fatal dose: 2 to 3 grains of Picrotoxin is considered to be a dangerous dose. Death from paralysis of heart in diastole.

TREATMENT:

Treat as in poisoning by Strychnine (q. v.), and give Paraldehyde.

CODEINE.

(See Opium).

COLCHICUM (MEADOW SAFFRON, AUTUMN CROCUS)—COLCHICINE.

HISTORY:

All parts of the plant are poisonous. The wine has been taken by mistake for sherry and other wines.

Fatal dose: 45 grains of dried bulb; a tablespoonful of the seeds; of the Wine $3\frac{1}{2}$ drachms, and an ounce of the Tincture. $1\frac{1}{2}$ ounces has caused death; an ounce has been recovered from. The fatal dose of the alkaloid is less than $\frac{1}{2}$ grain. Death from paralysis of respiratory centres. Death usually occurs within 24 hours; it has occurred in 7 hours, and has been delayed for several days.

SYMPTOMS:

Burning pain in throat, esophagus, and stomach; great thirst; soreness; vomiting; violent purging; griping; intense abdominal pain; urine suppressed; face pinched; pupils dilated; profuse salivation; pulse rapid, then slow; great weakness; skin cold, pale, and covered with sweat; frequent spasms; sometimes muscular pains and convulsions; consciousness present until the last; collapse.

TREATMENT:

There is no altogether satisfactory known antidote.

1. Evacuate the stomach: syphon out the stomach with stomach-tube, or, if vomiting has not occurred, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically (1/10 grain, repeated every 15 minutes until effective. After giving emetic, always give plenty of luke-warm water to encourage vomiting. **Give Tannic Acid** (in 30 grain doses) or Gallic Acid (in 30 grain doses, in 1/2 wine-glassful of water), or a decoction of oak bark, or strong tea.

2. Give water freely, and administer demulcents (such as white of egg, milk, oil, gum arabic, elm or flaxseed tea, barley or starch water, oatmeal gruel, gelatin, flour and water, or even crushed bananas), to soothe and protect the irritated or inflamed surfaces, particularly in later stages.

3. Employ artificial heat (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated,

applied to the feet and sides of the body) to maintain bodily temperature.

4. **Give Opium** (Powdered Opium, 1 to 2 grains every $\frac{1}{2}$ to 2 hours; or Laudanum, 20 drops every $\frac{1}{2}$ to 2 hours by mouth, or $\frac{1}{2}$ teaspoonful in gruel by rectum as frequently), or Morphine Sulphate ($\frac{1}{4}$ grain by mouth or hypodermically every $\frac{1}{2}$ to 2 hours), to relieve pain and nervous irritability.

5. **Stimulate heart, circulation, and respiration** with Brandy or Whisky (2 teaspoonful doses every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($\frac{1}{60}$ grain hypodermically every $\frac{1}{2}$ to 2 hours) and Atropine Sulphate ($\frac{1}{120}$ grain hypodermically every $\frac{1}{2}$ to 2 hours), or Tincture of Belladonna (20 drops every $\frac{1}{2}$ to 2 hours). Tincture of Digitalis (15 to 30 drops by mouth, or half as much hypodermically every $\frac{1}{2}$ to 2 hours), or Digitalin ($\frac{1}{100}$ grain hypodermically every $\frac{1}{4}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary), may be used for the same purposes. Draughts of strong coffee may also be given. **Apply hot fomentations to the abdomen.** Finally, give a dose of Castor Oil (1 to 2 tablespoonfuls).

COLOCYNTH.

(See Aloes).

CONIUM (HEMLOCK, COMMON OR SPOTTED HEMLOCK) — CONIINE.

HISTORY:

Has a mousy odor. Has been eaten for parsley, and eaten in salad and soup. Serious results from $\frac{1}{5}$ grain of Coniine.

Fatal dose of Coniine is about $2\frac{3}{10}$ grains. One drop may cause bad symptoms. Death in 4 hours.

SYMPTOMS:

Giddiness; staggering gait; gradual loss of all voluntary power; pupils dilated and fixed; paralytic drooping of eyelids; loss of sight; inability to swallow; nausea; maybe vomiting; frontal headache; pulse slow, then increased; sometimes salivation and sweating.

TREATMENT:

Keep head low.

1. **Evacuate the stomach**· syphon out the stomach with a stomach-tube, using plenty of water. If stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($1/10$ grain, repeated every 15 minutes until effective). After giving emetic, always give plenty of luke-warm water to encourage vomiting. **Give Tannic Acid or Gallic Acid** (30 grains in $1/2$ wineglassful of water, repeated in 10 to 20 minutes, if required). If these are not at hand, may give draughts of strong tea, or a decoction of oak bark; or give Iodine (1 grain) and Potassium Iodide (10 grains) in a $1/2$ wineglassful of water. Then again wash out the stomach, or cause vomiting.

2. **Give demulcents** (such as white of egg, milk, oil, gum arabic, flaxseed or elm tea, barley or starch water, oatmeal gruel, gelatin, flour and water, or even crushed bananas), to soothe and protect the irritated and inflamed surfaces. Then give Castor Oil (a tablespoonful).

3. **Stimulate heart, circulation, and respiration** with Brandy or Whisky (2 teaspoonful doses every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($\frac{1}{60}$ grain hypodermically every $\frac{1}{2}$ to 2 hours). May give Picrotoxin hypodermically ($\frac{1}{60}$ to $\frac{1}{40}$ grain dissolved in water. Tincture of Digitalis (15 to 30 drops by mouth, or half as much hypodermically every $\frac{1}{2}$ to 2 hours), or Digitalin $\frac{1}{100}$ grain hypodermically every $\frac{1}{4}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary) may be used for the same purposes.

4. **Employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body) to maintain bodily temperature. Employ friction.

If breathing becomes labored, resort to artificial respiration (rhythmically raise arms from side to up over head and back again, 20 times per minute). If convulsions, give Chloroform cautiously.

CONVALLARIA (LILY OF THE VALLEY).

HISTORY:

The common preparations—the extract and fluid extract—contain the two active principles Convallarin and Convallamarin. The former is a purgative, while the latter is a heart poison, quite similar in action to Digitalin.

Symptoms and treatment similar to Digitalis (q. v.).

COPPER AND ITS COMPOUNDS: COPPER SULPHATE (BLUE STONE, BLUE VITRIOL)—VERDIGRIS (COPPER SUBACETATE) — ETC.

HISTORY:

Copper is taken by accident or for the purpose of abortion, suicide, or murder. Commonest cause of poisoning is the use of copper vessels in cooking. Chronic poisoning may result from using copper to give a green color to pickles, preserved peas, and sweets; the use of green wrappers for foods; copper used in the manufacture of artificial flowers; the keeping of drugs in copper vessels; from working in copper or bronze, etc.

Fatal dose: death from an ounce of Copper Sulphate; and also a recovery. Death from $\frac{1}{2}$, also one ounce of Verdigris. Death in 4 hrs. to several days.

SYMPTOMS:

Copperish or metallic taste in mouth; griping and colicky pains; gastro-enteritis; nausea; bluish liquid vomit; purging with straining, stools consisting first of intestinal contents, then mucous or blood; intense salivation and bronchial secretion; incessant expectoration; jaundice; thirst; respiration hurried; anesthesia; delirium; epileptiform convulsions; pulse small, rapid; urine diminished, or suppressed, sometimes black; sometimes syncope; coma.

TREATMENT:

Avoid Vinegar, and Oils.

1. **Give the chemical antidote,** Potassium Ferrocyanide (Yellow Prussiate of Potash, in 5 to 15 grain doses in water); or give albumin and milk, mixed with sugar; or Magnesia. If eggs are not at hand, give a thin paste of flour and water; then

2. **Evacuate the stomach:** syphon out the stomach with a stomach-tube, using plenty of water. If stomach-tube is not at hand, use an emetic, such as

Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($1/10$ grain, repeated every 15 minutes until effective). After giving an emetic, always give repeatedly plenty of luke-warm water to encourage vomiting and to wash out the stomach. Follow with cathartic.

3. **Give demulcents** (egg and milk mixed and sweetened well with sugar is preferable and indicated; or give barley, elm or flaxseed tea, gum arabic, starch or flour water) to soothe and protect the irritated and inflamed surfaces.

4. **Employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body) to maintain bodily temperature.

5. **Give Opium** (Powd. Opium, 1-2 gr. every $1/2$ to 2 hours; or Laudanum, 20 drops every $1/2$ to 2 hours by mouth, or $1/2$ teaspoonful in gruel by rectum as frequently), or Morphine Sulphate ($1/4$ grain by mouth or hypodermically every $1/2$ to 2 hours), to relieve pain and nervous irritability. **If the breathing becomes much labored, employ artificial respiration.**

6. **Stimulate heart, circulation, and respiration** with Brandy or Whisky (2 teaspoonful doses every 10 to 15 minutes, or $1/4$ teaspoonful doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $1/4$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($1/60$ to $1/20$ grain hypodermically every $1/2$ to 2 hours) and Atropine Sulphate ($1/120$ grain hypodermically every $1/2$ to 2 hours), or Tincture of

Belladonna (20 drops every $\frac{1}{2}$ to 2 hours). Tincture of Digitalis (15 to 30 drops by mouth, or half as much hypodermically every $\frac{1}{2}$ to 2 hours), or Digitalin 1/100 grain hypodermically every $\frac{1}{4}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary), may be used for the same purpose. Draughts of strong coffee are good.

7. **Saturate the system** with Potassium Iodide (in 3 to 10 grain doses in water).

CORROSIVE SUBLIMATE.

(See Mercury Compounds).

CREOSOTE.

(See Acid Carbolic).

CROTON OIL (CROTON TIGLIUM).

HISTORY:

The oil and also the liniment have each been taken for Castor Oil by mistake.

Fatal dose: 20 drops. Half a drachm has been recovered from.

SYMPTOMS:

Severe abdominal pain; vomiting; purging; fluid stools; pulse small and thready; skin moist; face pinched; prostration; collapse; death.

TREATMENT:

1. **Evacuate the stomach:** syphon out the stomach with a stomach-tube, using plenty of water. If the stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if



APPEARANCE
OF STOMACH
IN POISONING BY
**CORROSIVE
SUBLIMATE**
(BRUNDAGE)

See pages 168, 314



not effective), or Ipecacuanha (Pulverized Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($1/10$ grain, repeated every 15 minutes until effective). After giving emetic, always give plenty of lukewarm water to encourage vomiting.

2. **Gum Arabic water and demulcents** (such as white of egg, milk, oil, gum arabic, flaxseed or elm tea, barley or starch water, oatmeal gruel, gelatin, flour and water, or even crushed bananas), to soothe and protect the irritated or inflamed surfaces.

3. **Give Opium** (Powd. Opium, 1-2 gr. every $1/2$ to 2 hours; or Laudanum, 20 drops every $1/2$ to 2 hours by mouth, or $1/2$ teaspoonful in gruel by rectum as frequently), or Morphine Sulphate ($1/4$ grain by mouth or hypodermically every $1/2$ to 2 hours), to relieve pain and purging.

4. **Employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body), to maintain bodily temperature. **Apply linseed meal poultices to abdomen.**

5. **Give Spirit of Camphor** (5 to 10 drops on sugar or in milk at 10 minute intervals, 4 to 6 times).

6. **Stimulate heart, circulation, and respiration** with Brandy or Whisky (2 teaspoonful doses by mouth every 10 to 15 minutes, or $1/4$ teaspoonful doses hypodermically as frequently), or with Spirit of Camphor (5 drops in a little milk every hour or two, if necessary), or with Aromatic Spirit of Ammonia (a teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($1/60$ grain hypodermically every $1/2$ to 2 hours) and Atropine Sulphate ($1/120$ to $1/60$ grain hypodermically every $1/2$ to 2 hours), or Tincture of Belladonna (10 to 20 drops in water every $1/2$ to 2 hours). Tincture of

Digitalis (15 to 30 drops by mouth, or half as much hypodermically every $\frac{1}{2}$ to 2 hours), or Digitalin 1/100 grain hypodermically every $\frac{1}{4}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary, may be used for the same purpose. Draughts of strong coffee may also be given.

CURARE (WOORARI, SOUTH AMERICAN "INDIAN ARROW POISON") — CUR- ARINE.

HISTORY:

Death by asphyxia.

SYMPTOMS:

Agitation; the poison wound swollen and painful; voluntary muscles completely paralyzed; temperature elevated; heart slowed; respiration gradually diminished; urine increased and contains sugar.

TREATMENT:

1. The poison is usually introduced through a wound. If there is a wound **ligate** above it; **incise** the part freely and endeavor to **suck out the poison**; **wash** the wound with a weak solution of Potassium Permanganate. Give Spirit of Nitrous Ether (1 to 2 teaspoonfuls in a wineglassful of water; repeat in 10 to 20 minutes). **Employ artificial respiration** as the most efficient antagonist (rhythmically raise extended arms from sides up to over head and back 18 times a minute) until poison is eliminated. The poison usually passes off rapidly. **Evacuate the bladder frequently, to prevent reabsorption.**

2. Stimulate the heart, circulation, and **respiration** with Brandy or Whisky (2 teaspoonfuls every 10 to 15 minutes, in a little water). Strychnine Sulphate (1/60 grain hypodermically every $\frac{1}{2}$ to 2

hours) has an antagonistic action upon the heart and respiration, and Atropine Sulphate ($1/120$ to $1/60$ grain hypodermically every $1/2$ to 2 hours), or Tincture of Belladonna (10 to 20 drops in water every $1/2$ to 2 hours) has a similar effect.

3. **Employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body), to maintain bodily temperature.

CYANIDE OF MERCURY (MERCURIC CYANIDE).

HISTORY:

10 grains, also 20 grains have destroyed life.

Symptoms and Treatment, according to most authorities, same as for Acid Hydrocyanic; according to some authorities, same as for Corrosive Sublimate. Be governed by symptoms, etc.

CYANIDE OF POTASSIUM (POTASSIC CYANIDE). (See colored plate, p. 317.)

HISTORY:

Potassium Cyanide is used in electro silvering and gilding, in photography, to clean lace, and also for the purposes of suicide and murder. $2\frac{1}{2}$ grains are equivalent to one grain of the Anhydrous Prussic Acid.

Fatal dose: about $2\frac{1}{2}$ grains is considered to be the fatal dose. Usually 5 grains is a fatal dose, in about 15 minutes. Recovery after 40 grains.

SYMPTOMS:

The Acid properties of Hydrocyanic Acid are very feeble, so that it does not have the effect of the mineral acids on the skin or mucous membrane; but Cyanide of Potassium is very alkaline and has even caustic properties—thus, on an empty stomach has produced a condition similar to that resulting

from a moderate quantity of solution of Potash. Salivation; nausea; sometimes vomiting; sense of constriction in throat; then constricting pain in chest; giddiness; confusion of sight; person falls in convulsions resembling epilepsy; convulsions may be general or attack only certain groups of muscles; sometimes true lockjaw; inspiration short; expiration prolonged and imminence of death increases length of interval between them; skin pale, blue or bluish gray; eyes glassy and staring; pupils dilated; mouth covered with foam; breath smells of the poison; pulse first quick and small, then slower, until imperceptible; convulsions pass into paralysis; respiration gradually ceases. Potassic Cyanide in very strong solution may cause erosion of lips, mouth, throat, gullet, and of much of the duodenum, but rarely. As a rule the local effects are limited to the stomach and duodenum.

TREATMENT:

Treat as in poisoning by Acid Hydrocyanic (q.v.); also employ demulcents if caustic action has been severe.

CYANIDE OF SILVER (SILVER CYANIDE).

SYMPTOMS:

The action is similar to that of Hydrocyanic Acid, but weaker.

TREATMENT:

Give large draughts of Ferrous Sulphate (Green Vitriol, $\frac{1}{2}$ to 2 grains in much water). Then treat as for poisoning by Hydrocyanic Acid.

DIGITALIS (FOX GLOVE) — DIGITALIN — STROPHANTHUS (q. v.) — “KOMBE ARROW POISON” — STROPHANTHIN (q.v.) CONVALLARIA (q. v.) — CONVALLAMARIN — SCOPARIUS — SCOPARIN — SPARTEINE — SQUILL — SCILLITIN — SCILLITOXIN.

HISTORY:

Has poisoned by being mistaken for other drugs or through ignorant use. Has been used for the purpose of murder.

Maximum dose: Powdered leaves, single, $4\frac{1}{2}$ gr.; daily, 15.4 gr. Infusion, single, 480 min.; daily, 1,440 min. Extract, single, 3 gr.; daily, 12 gr. Tincture, single, 45 min.; daily, 135 min. Digitalin, single, $\frac{1}{35}$ gr.; daily, $\frac{1}{12}$ gr.

Fatal dose: Tincture of Digitalis, 9 drachms; but 2 oz. have been recovered from. 10 grs. of the powdered leaves have been fatal. Death in hours or days.

Digitoxin is six to ten times stronger than Digitalin and $\frac{1}{16}$ grain is considered a fatal dose. The fatal dose of Digitalin is considered to be $\frac{3}{10}$ of a grain. Of ordinary commercial Digitalin slightly larger doses would be required to produce a fatal result, but $\frac{1}{16}$ grain would be very dangerous.

Digitalin is a cumulative poison, and like all poisons affecting the heart, a dose that once taken is harmless, becomes deadly if frequently repeated. As a rule, double the maximum dose may be considered quite dangerous.

SYMPTOMS:

(Digitalis is the type, the others act quite similarly).

Vomiting of matter of a grass green color, mucous and bile; purging with severe pain; severe headache; pupils usually dilated, sometimes contracted; eyeballs bulging; **sclerotic blue colored**; vision dis-

ordered; vertigo; salivation; pulse small, slow, irregular, but rapid and weak upon arising, although heart beats violently; face pale; pain in back and limbs; diarrhœa; suppression of urine; consciousness usually maintained; lethargy, followed by delirium and convulsions; coma; death suddenly. Death by paralysis of heart.

TREATMENT:

Put in horizontal position during and for some time after symptoms subside, to prevent fatal syncope.

1. **Evacuate the stomach:** siphon out the stomach with a stomach-tube, using plenty of water. If the stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 15 minutes if not effective), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($\frac{1}{10}$ grain, repeated every 15 minutes until effective). After giving an emetic, always give plenty of luke-warm water to encourage vomiting. **While emptying the stomach, give Tannic Acid or Gallic Acid** (30 grains in a cupful of water, then in 10 minutes again evacuate the stomach). If Tannic or Gallic Acid is not convenient, give plenty of strong tea, or a decoction of oak bark (1 ounce to a small cupful of hot water), or give Potassium Iodide (10 grains) and Iodine (1 grain, in half a wineglassful of water).

2. **Then give Epsom Salt** (1 to 2 tablespoonfuls in a teacupful of water), or Rochelle Salt (2 teaspoonfuls in a small cupful of water), then plenty of water.

3. **Then give Fluid Extract of Quillaja** (10 drops in a tablespoonful of water), or Fluid Extract of **Senega** (10 drops in water). For the effects of

large doses, give **Tincture of Aconite** (2 to 4 drops in water every $\frac{1}{2}$ to 2 hours), or **Laudanum** (15 to 20 drops in water every 1 to 3 hours), as an **antagonist** for effects due to the continued use of **Digitalis**. May give **Atropine**.

4. **Stimulate** with **Brandy** or **Whisky** (2 to 4 teaspoonfuls in water every $\frac{1}{2}$ to 1 hour), or with **Aromatic Spirit of Ammonia** (a teaspoonful every $\frac{1}{2}$ to 3 hours). Keep body warm. Employ friction.

5. **Resort to artificial respiration** if necessary (raise rhythmically arms extended at sides to up over head and back to sides, 18 times a minute).

Saponin and **Senegin** are the most complete physiological antagonists, if available.

DOG BITE.

(See **Saliva**).

DULCAMARA.

(As in **Belladonna**, q. v.).

ELATERIUM.

(See **Aloes**).

ERGOT.

HISTORY:

Given or taken to produce abortion.

15 to 60 grains of **Ergot** have produced very serious symptoms.

SYMPTOMS:

Not very definite as a rule.

More or less gastric disturbance; vomiting; thirst; diarrhoea; burning pain in feet; tingling in fingers; cramps in extremities; **pupils dilated**; dizziness; pulse small, feeble; weakness; **coldness of surface**; sometimes convulsions; abortion or miscarriage in pregnant women.

TREATMENT:**Recumbent position.**

1. **Evacuate the stomach:** syphon out the stomach with a stomach-tube, using plenty of water. If the stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($1/10$ grain, repeated every 15 minutes until effective). After giving emetic, always give plenty of luke-warm water to encourage vomiting.

While emptying the stomach, or at first, give Tannic Acid or Gallic Acid (30 grains in a cupful of water frequently). Then in ten minutes evacuate the stomach. If Tannic or Gallic Acid is not convenient, give plenty of strong tea, or a decoction of oak bark (1 ounce to a cupful of hot water), or give Potassium Iodide (10 grains) and Iodine (1 grain in $1/2$ wineglassful of water).

2. **Give Castor Oil** (2 tablespoonfuls), or Epsom Salt (2 tablespoonfuls in $1/2$ cupful of water), or a drop or two of Croton Oil on the back of the tongue.

3. **Stimulate** with Nitroglycerin Hydrochlorate ($1/100$ grain hypodermically), or with Brandy or Whisky (2 teaspoonful doses by mouth every 10 to 15 minutes, or $1/4$ teaspoonful doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $1/4$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($1/60$ grain hypodermically every $1/2$ to 2 hours) and Atropine Sulphate ($1/120$ to $1/60$ grain hypodermically every $1/2$ to 2 hours), or Tincture of Belladonna (20 drops in water every $1/2$ to 2 hours). Tincture of Digitalis (15 to 20 drops by mouth, or half as much hypo-

dermically every $\frac{1}{2}$ to 2 hours), or Digitalin (1/100 grain hypodermically every $\frac{1}{4}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary), may be used for the same purpose. Draughts of strong coffee may also be given.

4. **Employ friction, and artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body), to maintain bodily temperature.

If abortion is threatened from Ergot, Opium and rest are most important measures.

ETHER.

(See Anesthetics.)

EXALGIN.

(See Acetanilid.)

EUPHORBIIUM.

(See Aloes.)

FISH BERRIES.

(See Coccus Indicis.)

FLY PAPER, POISONOUS.

Commonly contains Arsenic (q. v.).

FORMALDEHYDE—FORMALIN.

HISTORY :

Formaldehyde is a powerfully disinfectant gas. It is employed as a disinfectant for clothing, rooms, etc. Formalin is a 40 per cent. solution of gaseous Formaldehyde, and is used as an antiseptic and disinfectant in solutions ranging from 1 to 2,000 to, 1 to 200. When swallowed it has a caustic effect.

SYMPTOMS :

From inhalation :

Intense irritation of eyes and nose; dyspnœa; throbbing pain in head; sense of suffocation.

From swallowing a Formaldehyde solution (commonly a 4, 10, or 40 per cent. solution): Pain in stomach; nausea or vomiting; vomit may be bloody; dyspnœa; vertigo; intense anxiety; pulse rapid and

small; urine suppressed; may be diarrhoea; coma; collapse.

TREATMENT:

When inhaled:

Fresh air; gentle stimulation if necessary.

When swallowed:

1. Ammonia is considered the best antidote, forming a harmless hexamethylene amine. Three volumes of Spirit of Mindererus should be administered for every volume of 40 per cent. Formaldehyde solution which has been swallowed. An alkaline mineral water may then be given, to neutralize the acetic acid resulting from the reaction. In the absence of other agents, white of egg stirred up in water may be given and the stomach then washed out or evacuated by Apomorphine Hydrochlorate (in 1-10 gr. doses).

2. **Stimulate** with hypodermic injections of Strychnine, Digitalin, Aromatic Spirit of Ammonia, etc.

3. Give demulcents, as milk, barley water, etc.

FOOD, POISONOUS.

Poisonous Cheese, Poisonous Fish, Poisoned Meat, Poisoned Milk, Putrid Meat.

Fungi (such as Poisonous Mushrooms, Toadstools, Truffles, etc.). Also, Muscarine, Sausage Poison, etc. (Also see Ptomaines.)

HISTORY:

It is supposed that the symptoms of **food-poisoning** are due either to **toxins**, or to several causes combined. Phallin, a toxalbumin from *Amanita Phalloides*, breaks up red blood corpuscles. The only antidote is transfusing fresh blood or salt solution. Food poisoning is commonest from bacterial products.

SYMPTOMS:

The symptoms are generally those of a powerful gastro-intestinal irritant. Usually there is a 2 to 6 hours incubation period.

Usual symptoms: nausea; sudden and severe retching; abdominal pain; dilated pupils; reddened or scarlatina-like skin; great thirst; very offensive diarrhoeal discharges; elevated or reduced temperature;

muscular twitchings; prostration and tendency to collapse.

Poisonous Cheese usually causes retching, vomiting, purging, dyspnœa, dilated pupils, rapid pulse, and depression of temperature. Cheese poisoning is attributed to tyrotoxinon. (See Ptomaines.)

Poisonous Fish (such as craw-fish, land crab, yellow-billed sprat, dolphin, gray snapper, conger eel, mussels, smooth bottle-fish, grooper, rock-fish, Portuguese man-of-war, king-fish, porgie, tunny, old wife, blower, etc.) causes symptoms of severe irritation of the gastro-intestinal tract, somewhat resembling cholera morbus. Some fish always poisonous from gland secretions, etc.; others only in spawning season; may poison from bacterial products. **Mussels** frequently produce very alarming symptoms, due to a leukomain called mytilotoxine, the action of which resembles that of Curarine. When mussels are gathered from the bottom of a ship, in dock, they are apt to be contaminated with Copper from the sheathing or with Arsenic from the paint. **Pickled Salmon and Herrings** sometimes produce poisonous symptoms. In some cases of poisoning by fish the symptoms are those of simple irritation, such as nausea, vomiting, purging, cramps, depression, etc. In other cases there are marked nervous symptoms, while the symptoms of gastro-enteric irritation are slight. The chief nervous symptoms are delirium, weakness, thirst, sense of heat about head and eyes, insensibility, dyspnœa, coma, and convulsions. Sometimes eruption appears resembling nettlerash and associated with asthma.

Poisoned Milk or Meat, such as that of birds or animals which have fed upon stramonium, laurel, or other poisonous plants or substances, produce the characteristic symptoms. Putrid or decaying meat produces symptoms of gastro-enteric irritation and also of a typhoid character, or septicæmia. (See Wounds, Poisonous.)

Poisoning may be produced: by meat from sick animal; by germs in food, as typhoid; or specific disease of animal, as tuberculosis; or food infected with parasites or their ova, as trichina.

Fungi: various forms of fungi, such as mush-

rooms, toadstools, truffles, etc., are directly poisonous and produce symptoms of severe irritation of the gastro-intestinal tract. **Poisonous Mushrooms**, mistaken for edible varieties or through ignorance of their poisonous properties, produce such narcotic-irritant symptoms as violent vomiting, purging, anxiety, thirst, abdominal pain, delirium, stupor, etc. The symptoms commonly occur within an hour, and death usually within 24 hours. The gills and spores of the mushroom should be sought for in stomach contents.

Muscarine—a deadly alkaloid from various mushrooms, as the Fly Fungus (Fly-Blown Agaric, False Orange). Fly Fungus is used in Kamschatka and Siberia to produce intoxication. Muscarine produces salivation; free perspiration; desire to urinate; violent colic with thirst; slow, weak pulse; contracted pupils, dilating before death; dyspnœa; paralysis. Death from effect upon the heart, usually in 24 hours.

May often distinguish poisonous from non-poisonous mushrooms by the following: Gills of poisonous usually white, cap often warty and stem hollow. Gills of non-poisonous first pink, then brownish-purple; stalk commonly cylindrical and solid. Reject mushrooms which have white gills or milky juice, or in which the color changes when they are broken or cut.

Sausage Poison—It is claimed that in uncured sausage-meat, a ptomaine is sometimes developed by bacterial growths, which causes symptoms of sausage poisoning. Recent discoveries, however, indicate the poison to be allied to the tetanus, diphtheria, and other toxins. Serious illness may be caused by eating sausage infected with *trichina spiralis*, a minute worm coiled up in an oval cyst. This is the most minute and numerous of the parasites. Its source is raw or imperfectly cooked pork or sausages. While enveloped in its capsule, the parasite is absolutely harmless. After entering the alimentary canal, it leaves its cyst and produces numerous young, which bore through walls to the muscular tissue of the body, where they lodge in the muscular-fibre sheaths. *Trichinæ* produce malaise, anorexia, sleeplessness, fever,

severe muscular pains, swelling of joints, sometimes contractions of flexors of extremities, œdema of face and eyelids, diarrhœa. Sometimes typhoid symptoms appear, and death in unconscious state results. Death usually within 30 days. Chemical and microscopical examinations of suspected food or of a portion of the subject's muscle should indicate nature of poison (p. 238). Occasionally poisoning by union of malic acid of fruit juices with metal used in canning.

TREATMENT:

1. **Evacuate the stomach:** syphon out the stomach with a stomach-tube, using plenty of water. If a stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 15 minutes if not effective), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically (1/10 grain, repeated every 15 minutes until effective). After giving an emetic, always give plenty of luke-warm water to encourage vomiting. **While syphoning or before producing vomiting, give, if at hand, Tannic Acid or Gallic Acid** (30 grains in 2 tablespoonfuls of water), or liberal draughts of strong tea, or a decoction of oak bark (a teaspoonful to 2 wineglassfuls of hot water). **Then evacuate the stomach again**, unless vomiting continues. To relieve nausea after stomach has been emptied, give Lime Water and Creosote (put 2 drops of Creosote in a tablespoonful of Lime Water and give a teaspoonful of the mixture frequently).

2. **Give Castor Oil** (2 tablespoonfuls) and use an enema. **In poisoning by Fungi, give Epsom Salt** (2 tablespoonfuls in small cupful of water), or Glauber Salt (2 teaspoonfuls in 4 tablespoonfuls of water). After purging give vinegar in water.

3. **Stimulate.** If depression is very great, support heart with Nitroglycerin (in 1/100 grain

doses), or stimulate with Brandy or Whisky (a teaspoonful dose by mouth every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($\frac{1}{60}$ grain hypodermically every $\frac{1}{2}$ to 2 hours), or Atropine Sulphate ($\frac{1}{120}$ grain hypodermically every $\frac{1}{2}$ to 2 hours), or Tincture of Belladonna (20 drops in water every $\frac{1}{2}$ to 2 hours). Tincture of Digitalis (15 to 20 drops by mouth, or half as much hypodermically every $\frac{1}{2}$ to 2 hours), or Digitalin ($\frac{1}{100}$ grain hypodermically every $\frac{1}{4}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary), may be used for the same purpose. Draughts of strong coffee may also be given.

4. **If body or feet are cold employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body). Also apply hot fomentations to the abdomen. In collapse, use sterilized salt solution (p. 118).

5. **Give Opium** (Powdered Opium, 1 to 2 grains every $\frac{1}{2}$ to 2 hours), or Laudanum (20 drops every $\frac{1}{2}$ to 2 hours by mouth, or $\frac{1}{2}$ teaspoonful in gruel by rectum as frequently), or Morphine Sulphate ($\frac{1}{4}$ grain by mouth or hypodermically every $\frac{1}{2}$ to 2 hours), to relieve pain and nervous irritability. Also **give Tincture of Capsicum** (15 to 20 drops in $\frac{1}{2}$ cupful of water). **Give solution of Ammonium Acetate** (in teaspoonful doses every $\frac{1}{2}$ hour) to reduce fever and relieve kidneys.

In fish poisoning, give Potassium Chlorate freely, or Spirit of Mindererus; also Capsicum and Chloroform.

In poisoning by the Fungi, give, as early as possible, **Atropine Sulphate**, hypodermically ($\frac{1}{120}$

grain every $\frac{1}{4}$ to 2 hours) as a specific antagonist; or after stomach has been emptied, Tincture of Belladonna (20 drops in water every $\frac{1}{2}$ to 2 hours by mouth) may be given instead of the Atropine. **Atropine** exactly opposes **Muscarine**.

Antiseptics (such as Thymol, Salol, Naphthalin or Calomel) are recommended in the after treatment.

There is no known remedy for trichinæ.

FUSEL OIL (AMYL ALCOHOL, q. v.).

GAMBOGE.

(See Aloes).

GASEOUS POISONS.

BROMINE (q. v.).

CARBON DIOXIDE (see Carbonic Acid Gas).

CARBON MONOXIDE (q. v.).

CHLORINE (q. v.).

FORMALDEHYDE (q. v.).

MURIATIC ACID FUMES.

NITROUS ACID FUMES.

HYDROGEN ANTIMONIDE (STIBIN).

HYDROGEN ARSENIDE (ARSENIURETTED HYDROGEN).

HYDROGEN SULPHIDE (q. v.).

NITROGEN MONOXIDE (NITROUS OXIDE). (See Anesthetics).

PHOSPHINE (PHOSPHORETTED HYDROGEN).

SULPHUR DIOXIDE (SULPHUROUS OXIDE).

MIXED GASES.

FUEL GAS (active ingredient Carbon Monoxide, q. v.; also Illuminating Gas).

FURNACE GASES.

ILLUMINATING GAS (Coal Gas, Water Gas—See Illuminating Gas).

SEWER GAS AND CESSPOOL EMANATIONS (q. v.).

SYMPTOMS:

Regarding gaseous poisons it may in a general sense be said, that they cause dizziness, headache, nausea, sense of suffocation, exhaustion, and collapse.

TREATMENT:

Fresh air, oxygen, rest, gentle stimulation and artificial respiration, as a rule.

GASOLINE.

(See Petroleum).

GELSEMIUM (YELLOW JASMINE) — GELSEMINE.**HISTORY:**

Has been more or less used as a pain-killer and to produce abortion. Has also caused poisoning through taking by mistake.

Fatal dose: of the Fluid Extract (which is 4 times stronger than the Tincture) of Gelsemium 1 also 2 drachms. 35 drops of the Tincture have caused death in $1\frac{1}{2}$ hours. A concentrated Tincture equivalent to $\frac{1}{6}$ grain of Gelsemine caused death in $7\frac{1}{2}$ hours. Death by paralysis of the respiratory centres.

SYMPTOMS:

Pain in brows and eyeballs; vision dim, sometimes double; pupils dilated; ptosis; dropping of jaw; sense of languor; drowsiness; great muscular relaxation; staggering; pulse rapid, feeble; skin cold, moist; face anxious; voice lost; pain in chest; respiration slow, labored; sensibility diminished; suffocation; spasm; foaming at mouth; coma.

TREATMENT:

1. **Evacuate the stomach;** syphon out the stomach with a stomach-tube, using plenty of water. If stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 10 to 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful

every 10 or 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically (1/10 grain, repeated every 15 minutes until effective). After giving the emetic, give plenty of luke-warm water to encourage vomiting.

While syphoning, or before causing patient to vomit, give, if at hand and poison recently taken, **Tannic Acid or Gallic Acid** (30 grains in 2 tablespoonfuls of water), or liberal draughts of strong tea, or a decoction of oak bark (a teaspoonful to 2 wineglassfuls of hot water). Then evacuate the stomach again, unless vomiting continues.

2. **Give Castor Oil** (2 tablespoonfuls).

3. **Stimulate.** **Belladonna or Atropine** are good antagonists. Give Atropine Sulphate (1/120 to 1/60 grain hypodermically every 1/2 to 2 hours), or Tincture of Belladonna (20 drops in water every 1/4 to 2 hours). Stimulate heart, circulation, and respiration with Brandy or Whisky (2 teaspoonful doses, by mouth every 10 to 15 minutes, or 1/4 teaspoonful doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or 1/4 teaspoonful hypodermically as frequently; also with Strychnine Sulphate (1/60 to 1/20 grain hypodermically every 1/4 to 2 hours). Tincture of Digitalis (15 to 30 drops by mouth, or half as much hypodermically, every 1/4 to 2 hours), or Digitalin (1/100 grain hypodermically, every 1/4 to 1 hour), or Caffein Citrate (1 to 4 grains every 1/4 to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every 1/4 to 1 hour if necessary), may be used for the same purpose. Draughts of strong coffee may also be given.

4. **Morphine** is considered to be the most complete antagonist (give 1/4 grain every 1/2 to 2 hours).

5. **Resort to electricity if necessary.** Arouse by hot and cold water alternately douched on head and chest.

6. **Employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids heated, applied to the feet and sides of the body) to maintain bodily temperature. Employ friction.

7. **If respiration ceases** or is labored, resort to **artificial respiration** (rhythmically raise and lower the extended arms from the sides up to over head and back again 18 times a minute).

GOLD.

SYMPTOMS:

Irritant symptoms. It causes a pink stain upon the skin.

TREATMENT:

1. **Give Albumin** (white of egg) or flour (in water freely, and Sulphate of Iron (in 1 grain doses) promptly.

2. **Evacuate the stomach without delay** (either independent of or in conjunction with above) **if free vomiting has not already begun**. Syphon out the stomach with a stomach-tube, using plenty of water. If a stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 10 to 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically (1/10 grain, repeated every 15 minutes until effective). After giving the emetic, give plenty of luke-warm water to encourage vomiting.

While syphoning, or before causing patient to vomit, give, if at hand and poison recently taken, **Tannic Acid or Gallic Acid** (30 grains in 2 tablespoonfuls of water), or liberal draughts of strong tea, or a decoction of oak bark (a teaspoonful to 2

wineglassfuls of water). Then evacuate the stomach again, unless vomiting continues.

3. **Stimulate heart, circulation, and respiration** with Brandy or Whisky (2 teaspoonful doses by mouth every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($\frac{1}{60}$ grain hypodermically every $\frac{1}{4}$ to 2 hours) and Atropine Sulphate ($\frac{1}{120}$ to $\frac{1}{60}$ grain hypodermically every $\frac{1}{2}$ to 2 hours), or Tincture of Belladonna (20 drops in water every $\frac{1}{2}$ to 2 hours). Tincture of Digitalis (15 to 20 drops by mouth, or half as much hypodermically, every $\frac{1}{2}$ to 2 hours), or Digitalin ($\frac{1}{100}$ grain hypodermically every $\frac{1}{4}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary), may be used for the same purposes. Draughts of strong coffee may also be given.

4. **Employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body), to maintain bodily temperature.

HELLEBORE.

(See under Veratrum).

HYDROGEN SULPHIDE (SULPHURETTED HYDROGEN).

HISTORY:

A very active narcotic poison, but its characteristic offensive rotten-egg-like odor prevents frequent accident. May prove instantly fatal if inhaled pure; even when diluted, if breathed, causes prompt insen-

sibility and even death; probably the result of rapid destruction of the blood corpuscles. Encountered by workmen in drains, sewers and cesspools. Usually, when encountered, is combined with other gases resulting from putrefaction of animal matter. The dark-brown or black color of the blood is due to the destruction of the blood corpuscles.

Death by asphyxia.

SYMPTOMS:

Breathed in a diluted state, it quickly produces unconsciousness and death. Persons remaining long in an atmosphere contaminated with this gas experience nausea, weakness and giddiness, loss of blood from mouth, pupils dilated and fixed, face livid, convulsions, coma.

TREATMENT:

1. **Take patient into open air**; or if possible, provide the patient with air containing **Chlorine Gas** to break up the Hydrogen Sulphide.

2. **Employ friction** of limbs and trunk.

3. **Apply heat to the body** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body to maintain bodily temperature.

4. **Stimulate heart, circulation, and respiration** with Brandy or Whisky (2 teaspoonful doses every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($\frac{1}{60}$ grain hypodermically every $\frac{1}{2}$ to 2 hours) and Atropine Sulphate ($\frac{1}{120}$ grain hypodermically every $\frac{1}{2}$ to 2 hours), or Tincture of Belladonna (20 drops in water every $\frac{1}{2}$ to 2 hours). Tincture of Digitalis (30 drops by mouth, or half as much hypodermically, every $\frac{1}{2}$ to 2 hours), or Digitalin ($\frac{1}{100}$ grain hy-

podermically every $\frac{1}{4}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary), may be used for the same purposes. Draughts of strong coffee may also be given.

5. For threatened death from embarrassed respiration, resort to artificial respiration (rhythmically raising and lowering arms from straight at sides to up over head and back again, 18 to 20 times a minute).

HYOSCYAMUS.

(Treat as for Belladonna, q. v.).

ILLUMINATING GAS (COAL GAS, WATER GAS)—FUEL GAS.

HISTORY:

The facts stated regarding Carbonic Oxide apply in the main to Illuminating Gas; but the physiological effects of the latter are due to its displacing air, thus removing oxygen, and to the combined effect of this gas and heavier hydrocarbons. Poisoning has occurred from leakage of pipes in an adjoining room or from cellar or even a street main, the gas filtering in such case through the soil and perhaps so diluted as to be odorless, yet poisoning. The gas may be diffused through walls and partitions. Water Gas is more dangerous than Coal Gas.

SYMPTOMS:

Headache; confusion; dizziness; nausea; uncertain gait; weakness; loss of memory; unconsciousness; asphyxia; death. May be convulsions. The patient may rouse up for a little while and seem intelligent, and then again become unconscious or have convulsions.

The symptoms vary in poisoning by Illuminating Gas, according to whether they are those of true asphyxia or of Carbonic Oxide poisoning.

Suffocation, due to an overwhelming quantity of the gas stopping respiration, exhibits such characteristic symptoms as choking, gasping, suffused eyes, congested face, collapse.

Asphyxia by Illuminating Gas (producing suffocation) is very different from **poisoning** resulting from breathing the diluted gas.

Headache, dizziness, loss of appetite and malaise may be due to a slow poisoning from small amounts of gas present in the air of rooms.

TREATMENT:

No true antidote for poisoning by the gas is known.

For true poisoning by the gas, treat as for Carbon Monoxide (q. v.).

For suffocation by the gas, fresh air inhalations and gentle stimulation. If necessary, artificial respiration. (See 1 and 4 under Carbon Monoxide).

INSECT POWDER, POISONOUS.

(Treat as in Arsenic Poisoning, q. v.).

INSECTS, POISONOUS.(See p. 238.)

The bite or sting of bee, hornet, wasp, etc.

SYMPTOMS:

Usually mainly local irritation. When by tarantula or scorpion may be serious and consist of: pain; swelling; fever; erysipelas; suppuration; gangrene; death.

TREATMENT:

In mild cases apply strong solution of Ammonium Chloride, or soap, strong soap-suds, or other alkali to affected part. If stinger was left in, extract it. Cold wet cloths, Camphorated Chloral, or Beta Naphthol. Ointment (30 gr. to oz.), for pain. Stimulate.

In severe cases treat as for snake bite. (q. v.)

IODINE AND IODIDES.

HISTORY:

Iodine is sometimes taken by mistake for harmless mixtures or medicines. Rarely used for suicide or murder. 20 grs. caused death. Recovery has occurred after taking $1\frac{1}{2}$ drachms. Death from 1 drachm of Tincture. Death usually occurs within 30 hours.

SYMPTOMS:

Pain in throat and stomach; metallic taste in mouth; salivation; great thirst; severe gastro-enteritis; vomiting; purging; vomit yellow from Iodine, blue if farinaceous articles be present in stomach; face deathly pale; urine entirely suppressed; giddiness; faintness; pulse rapid, feeble; high fever; pain in larynx; eyelids sometimes swollen; albuminuria; cyanosis; great excitement; convulsive movements; collapse.

TREATMENT:

I. **Evacuate the stomach:** syphon out the stomach with a stomach-tube, using plenty of water. If a stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 10 to 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful, every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically (1/10 grain, repeated every 15 minutes until effective). After giving the emetic, give plenty of luke-warm water to encourage vomiting.

Starch is the antidote to free Iodine forming Iodide of Starch. Promptly and freely give large quantities of starch, wheat flour or arrow-root water (water made by boiling starch in water or by pouring boiling water upon such), or give Sodium Thio-

sulphate (20 grains in 2 tablespoonfuls of water). The stomach must be evacuated soon after giving the antidote, as the compound is not altogether inactive. Also give Sodium Bicarbonate.

2. **Give demulcents** (such as white of egg, milk, oil, flaxseed or elm tea, barley water, gum arabic or oatmeal gruel, gelatin, or even crushed bananas), to soothe and protect the irritated or inflamed surfaces.

3. **Stimulate heart, circulation, and respiration** with Brandy or Whisky (2 teaspoonful doses by mouth every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($\frac{1}{60}$ grain hypodermically every $\frac{1}{4}$ to 2 hours) and Atropine Sulphate ($\frac{1}{120}$ to $\frac{1}{60}$ grain hypodermically, every $\frac{1}{2}$ to 2 hours), or Tincture of Belladonna (20 drops in water every $\frac{1}{2}$ to 2 hours). Tincture of Digitalis (15 to 30 drops by mouth, or half as much hypodermically, every $\frac{1}{2}$ to 2 hours), or Digitalin ($\frac{1}{100}$ grain hypodermically every $\frac{1}{4}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary), may be used for the same purpose. Draughts of strong coffee may also be given.

4. **Employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body), to maintain bodily temperature.

5. **Give Opium** (Powdered Opium, 1 to 2 grains every $\frac{1}{2}$ to 2 hours), or Laudanum, 10 to 20 drops every $\frac{1}{2}$ to 2 hours by mouth, or $\frac{1}{2}$ teaspoonful in gruel by rectum as frequently), or Morphine Sulphate ($\frac{1}{4}$ grain by mouth or hypodermically, every

$\frac{1}{2}$ to 2 hours), to relieve pain and nervous irritability.

IODOFORM—IODOL—ARISTOL.

HISTORY:

Iodoform taken by mistake or poisoning by absorption from surgical dressings. 4 drachms by mouth has been recovered from, but small doses have caused serious symptoms.; death from 30 grs.

GENERAL SYMPTOMS:

Drowsiness; slight delirium; emaciation; high temperature; rapid pulse; symptoms resemble meningitis.

TREATMENT:

1. Wash the wound with the Oil of Eucalyptus.
2. Give stimulants if necessary. Stimulate heart, circulation, and respiration with Brandy or Whisky (2 teaspoonful doses by mouth every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($\frac{1}{60}$ grain hypodermically every $\frac{1}{4}$ to 2 hours) and Atropine Sulphate ($\frac{1}{120}$ to $\frac{1}{60}$ grain hypodermically, every $\frac{1}{2}$ to 2 hours), or Tincture of Belladonna (20 drops in water every $\frac{1}{2}$ to 2 hours). Tincture of Digitalis (15 to 30 drops by mouth, or half as much hypodermically, every $\frac{1}{2}$ to 2 hours), or Digitalin ($\frac{1}{100}$ grain hypodermically, every $\frac{1}{4}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary), may be used for same purpose. Draughts of strong coffee may also be given. Give Potassium Bromide, and Potassium Bicarbonate.

IPECACUANHA.

SYMPTOMS:

Vomiting; hematemesis; hemoptysis.

TREATMENT:

1. **Wash out the stomach if possible.**
2. **Give vegetable acids**, such as vinegar and water (equal parts), Acetic Acid, diluted (a teaspoonful in $\frac{1}{2}$ pint of water), Citric Acid or Tartaric Acid ($\frac{1}{2}$ to 2 drachms in a pint of water), or clear lemon juice, or orange juice, freely.
3. **Give stimulants if necessary.** Stimulate heart, circulation, and respiration with Brandy or Whisky (2 teaspoonful doses, by mouth every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($\frac{1}{60}$ grain hypodermically every $\frac{1}{4}$ to 2 hours) and Atropine Sulphate ($\frac{1}{120}$ to $\frac{1}{60}$ grain hypodermically, every $\frac{1}{2}$ to 2 hours), or Tincture of Belladonna (20 drops in water every $\frac{1}{2}$ to 2 hours). Tincture of Digitalis (15 to 30 drops by mouth, or half as much hypodermically, every $\frac{1}{2}$ to 2 hours), or Digitalin ($\frac{1}{100}$ grain hypodermically, every $\frac{1}{4}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary), may be used for the same purpose. Draughts of strong coffee may also be given. Give Opium or Morphine for pain.

JABORANDI (PILOCARPUS) — PILOCARPINE.

HISTORY:

The dangerous dose of Pilocarpine is assumed to be 2 grains subcutaneously.

SYMPTOMS:

Profuse sweating; dizziness; salivation; vomiting; purging; tearing pain in eyeballs; contracted pupils; myopia.

TREATMENT:

1. **Evacuate the stomach:** syphon out the stomach with a stomach-tube, using plenty of water. If stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 10 to 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($1/10$ grain, repeated every 15 minutes until effective). After giving the emetic, give plenty of luke-warm water to encourage vomiting.

While syphoning, or before causing patient to vomit, give, if at hand and poison recently taken, **Tannic Acid or Gallic Acid** (30 grains in 2 tablespoonfuls of water), or liberal draughts of strong tea, or a decoction of oak bark (a teaspoonful to 2 wineglassfuls of hot water). Then evacuate the stomach again, unless vomiting continues.

2. **Give Atropine Sulphate**—($1/100$ grain antagonizes $1/6$ grain of Pilocarpine)—($1/120$ to $1/60$ grain hypodermically every $1/2$ to 2 hours), or Tincture of Belladonna (20 drops in water every $1/2$ to 2 hours by mouth). Very efficacious in arresting the symptoms.

3. **Stimulate heart, circulation, and respiration** with Brandy or Whisky (2 teaspoonful doses by mouth every 10 to 15 minutes, or $1/4$ teaspoonful doses hypodermically as frequently), or Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $1/4$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($1/60$ grain hypodermically every $1/4$ to 2 hours) and Atropine Sulphate ($1/120$ to $1/60$ grain hypodermically, every 20 minutes until pupils are dilated), or Tincture of Belladonna (20 drops in water every 20 minutes until the pupils are dilated).

Tincture of Digitalis (15 to 30 drops by mouth, or half as much hypodermically, every $\frac{1}{2}$ to 2 hours), or Digitalin ($\frac{1}{100}$ grain hypodermically, every $\frac{1}{4}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary), may be used for the same purpose. Draughts of strong coffee may also be given.

4. **Morphine Sulphate** ($\frac{1}{4}$ grain every $\frac{1}{2}$ to 2 hours) to control nausea and vomiting.

JALAP.

SYMPTOMS:

Large, watery stools; tormina; tenesmus.

TREATMENT:

1. **Evacuate the stomach**; syphon out the stomach with a stomach-tube, using plenty of water. If stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 10 to 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($\frac{1}{10}$ grain, repeated every 15 minutes until effective). After giving the emetic, give plenty of luke-warm water to encourage vomiting.

2. **Give demulcents** (such as white of egg, milk, oil, flaxseed or elm tea, barley, gum arabic or starch water, oatmeal gruel, gelatin, flour and water, or even crushed bananas) to soothe and protect the irritated or inflamed surfaces.

3. **Stimulate heart, circulation, and respiration** with Brandy or Whisky (2 teaspoonful doses by mouth every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful

doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($\frac{1}{60}$ grain hypodermically, every $\frac{1}{4}$ to 2 hours) and Atropine Sulphate ($\frac{1}{120}$ to $\frac{1}{60}$ grain hypodermically, every $\frac{1}{2}$ to 2 hours), or Tincture of Belladonna (20 drops in water every $\frac{1}{2}$ to 2 hours). Tincture of Digitalis (15 to 30 drops by mouth, or half as much hypodermically, every $\frac{1}{2}$ to 2 hours), or Digitalin ($\frac{1}{100}$ grain hypodermically, every $\frac{1}{4}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary), may be used for the same purpose. Draughts of strong coffee may also be given.

KEROSENE. "KNOCK-OUT" DROPS.

(See Petroleum.) (Commonly contain Chloral, with perhaps Opium, Hyoscyamus, Bromides or Cannabis.)

LABURNUM (THE SEEDS, WOOD, BARK, LEAVES, FLOWERS, PODS)—CYTISINE—ARNICA.

HISTORY:

All parts of Laburnum are poisonous, due to the presence of Cytisine, which is also contained in Arnica. Half an ounce of the Laburnum root has caused very serious symptoms.

SYMPTOMS.

Symptoms usually come on very rapidly; vomiting; purging; restlessness; drowsiness; twitchings; rigidity; convulsions; coma.

TREATMENT:

1. **Evacuate the stomach;** syphon out the stomach with a stomach-tube, using plenty of water. If the stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 15 minutes if vomiting is not

produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($1/10$ grain, repeated every 15 minutes until effective). After giving emetic, always give plenty of luke-warm water to encourage vomiting. **Give Tannic Acid or Gallic Acid** (30 grains in a cupful of water, then 10 minutes afterwards again evacuate the stomach). If Tannic or Gallic Acid not convenient, give plenty of strong tea or a decoction of oak bark.

2. **Give Epsom Salt** ($1/2$ to 1 ounce—I to 2 tablespoonfuls—in a teacupful of water), or Rochelle Salt (2 teaspoonfuls in a small cupful of water).

3. **Stimulate heart, circulation, and respiration** with Brandy or Whisky (2 teaspoonful doses by mouth every 10 to 15 minutes, or $1/4$ teaspoonful doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $1/4$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($1/60$ grain hypodermically every $1/2$ to 2 hours), and Atropine Sulphate ($1/120$ grain hypodermically every $1/2$ to 2 hours), or Tincture of Belladonna (20 drops in water every $1/2$ to 2 hours). Tincture of Digitalis (15 to 20 drops by mouth, or half as much hypodermically every $1/2$ to 2 hours), or Digitalin ($1/100$ grain hypodermically every $1/4$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $1/4$ to 1 hour if necessary), may be used for the same purposes. Draughts of strong coffee may also be given (a pint by enema).

4. **Employ alternately, hot and cold douches** to the head and chest to arouse the patient.

LACTUCARIUM.

Symptoms somewhat similar to those of Opium.
Treat as in Opium.

LAUDANUM.

(See Opium).

LAUGHING GAS.

(See Anesthetics).

LEAD AND ITS COMPOUNDS.

HISTORY:

Poisoning from Lead is usually by the Acetate ("Sugar of Lead"), sometimes by the Carbonate ("White Lead"), by Red Lead, or by Goulard's Extract. Sugar of Lead has been accidentally mixed with flour, in place of alum. White Lead has been mistaken for chalk, and Goulard's Extract for wine, resulting in poisoning.

1½ drachms of the basic Acetate has caused serious symptoms; an ounce of Sugar of Lead has been taken without fatal result; Goulard's Extract ¾ pint has been recovered from, also an ounce of White Lead; about 2½ drachms of the Carbonate of Lead caused the death of a child. Death in fatal cases is usually 3 or 4 days after the patient is prostrated.

SYMPTOMS:

Throat dry; great thirst; sweet, metallic taste in mouth; **colic, relieved by pressure**; abdominal muscles very rigid; cramps in legs; paralysis of extremities; vomited matters white; stools black; sometimes constipation; rapid, tense, cord-like pulse, becoming weak and relaxed; anxious, pinched, livid face; vertigo; anesthesia; stupor; muscular twitching; convulsions; coma; death. (In chronic lead poisoning there is a blue line at the margin of the gums).

TREATMENT:

A soluble sulphate, such as Magnesium Sulphate, should be given, as it forms insoluble Lead Sulphate. Also give white of egg with the Magnesium Sulphate.

Treat same as for poisoning by Barium compounds (q. v.). Morphine and Atropine for vomiting and colic; or Alum for colic. Put $1\frac{1}{2}$ drachms Powdered Alum in pint boiling milk, separate curd, sweeten with sugar, give wineglassful every 1 or 2 hrs. Eliminate poison by Potassium Iodide (10 to 20 grains in water every 2 to 4 hours), which renders it soluble. Elimination takes place by bile, perspiration and urine. Also employ sulphur baths. Use electricity.

LIME.**SYMPTOMS:**

Burning pain in the abdomen; intense thirst; obstinate constipation.

TREATMENT:

1. **Give a vegetable acid:** lemon juice or orange juice freely; or Citric Acid (1 to 2 drachms to a pint of water), or Tartaric Acid (1 to 2 drachms to a pint of water), or Acetic Acid (a teaspoonful in $\frac{1}{2}$ pint of water), or Vinegar (in $\frac{1}{2}$ cupful doses, with water). The soluble sulphates, such as Magnesium or Sodium Sulphate (in 1 to 2 tablespoonful doses in water) have been recommended.

2. **Give demulcents** (such as white of 3 or 4 eggs, milk, oil, flaxseed or elm tea, barley water, gum arabic or starch water, oatmeal gruel, or even crushed bananas) to soothe and protect the irritated or inflamed surfaces.

3. **If pain is severe, give Opium** (Powdered Opium, 1 to 2 grains every $\frac{1}{2}$ to 2 hours), or Laudanum (20 drops every $\frac{1}{2}$ to 2 hours by mouth, or $\frac{1}{2}$ teaspoonful in gruel by rectum as frequently), or Morphine Sulphate ($\frac{1}{4}$ grain by mouth, or hypodermically every $\frac{1}{2}$ to 2 hours), to relieve pain and nervous irritability.

LOBELIA (LOBELIA INFLATA, INDIAN TOBACCO).

HISTORY:

A drachm of the powdered leaves is considered a fatal dose. Death in $\frac{1}{2}$ to 4 days.

SYMPTOMS:

Violent vomiting; severe depression and prostration; sometimes violent purging; cold sweat; pale skin; feeble pulse; giddiness; tremors; sometimes burning pain in fauces and esophagus; convulsions; coma; collapse; death.

TREATMENT:

Keep in recumbent position, even after acute symptoms are relieved.

1. Evacuate the stomach, if free vomiting has not already occurred, i. e., syphon out the stomach with a stomach-tube, using plenty of water. If a stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls water, repeated in 10 to 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective). After giving the emetic, give plenty of lukewarm water to encourage vomiting.

While syphoning, or before causing patient to vomit, give, if at hand and poison recently taken, **Tannic Acid or Gallic Acid** (30 grains in 2 tablespoonfuls of water), or liberal draughts of strong tea, or a decoction of oak bark (a teaspoonful to 2 wineglassfuls hot water). Then evacuate the stomach again, unless vomiting continues. **Caustic alkalies** decompose the poison.

2. Give Castor Oil (2 tablespoonfuls).

3. Stimulate heart, circulation, and respiration with Brandy or Whiskey (2 teaspoonful doses, by mouth every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water

every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($\frac{1}{60}$ grain hypodermically every $\frac{1}{4}$ to 2 hours) and Atropine Sulphate ($\frac{1}{120}$ to $\frac{1}{60}$ grain hypodermically, every $\frac{1}{2}$ to 2 hours), or Tincture of Belladonna (20 drops in water every $\frac{1}{4}$ to 2 hours). Tincture of Digitalis (15 to 30 drops by mouth, or half as much hypodermically, every $\frac{1}{2}$ to 2 hours), or Digitalin ($\frac{1}{100}$ grain hypodermically every $\frac{1}{4}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary), may be used for the same purpose. Draughts of strong coffee may also be given.

4. **Employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body) to maintain bodily temperature.

5. **Give Opium** (Powdered Opium, 1 to 2 grains every $\frac{1}{2}$ to 2 hours), or Laudanum, 20 drops every $\frac{1}{2}$ to 2 hours by mouth, or $\frac{1}{2}$ teaspoonful in gruel by rectum as frequently), or Morphine Sulphate ($\frac{1}{4}$ grain by mouth, or hypodermically every $\frac{1}{2}$ to 2 hours), to relieve pain and nervous irritability.

LUNAR CAUSTIC.

(See Silver Compounds.)

MATCHES.

(See Phosphorus.)

MALE FERN.

(Evacuation, stimulation, as in Lobelia. **Avoid oil.**)

MERCURY AND ITS COMPOUNDS.

Bichloride of Mercury (Corrosive Sublimate)—

Red Precipitate (Red Oxide of Mercury)—

White Precipitate (Ammoniated Mercury),

etc. (See colored plate, p. 134.)

HISTORY:

Corrosive Sublimate has been dispensed for Calomel. It is used to kill insects and vermin, to pre-

serve specimens, also to prevent dry rot in timber. Death may result from a lotion or ointment of it. Antiseptic solutions used for washing out cavities and as a surgical dressing may poison.

Fatal dose: White Precipitate has caused dangerous symptoms in 30 to 40 grain doses; 10 grains of the Cyanide of Mercury has caused death; Turpeth Mineral has been fatal in doses of 40 grains; 3 grains of Corrosive Sublimate has been fatal; but recovery from an ounce taken on a full stomach, free vomiting being promptly induced. The rubbing into the body of a salve of finely divided Mercury for the itch has caused death. Inhalations of Mercury poured on red hot coals has caused death. The fatal result may occur in $\frac{1}{2}$ hour or be delayed to 2 weeks. An alcoholic solution of Corrosive Sublimate (80 grs. to ounce) applied to scalp for ring worm killed girl 9 yrs. of age. Death in $\frac{1}{2}$ hour to 10 days.

SYMPTOMS:

N. B.—The following symptoms refer especially to Corrosive Sublimate, but are in the main also characteristic of the others.

Severe gastro-enteritis; acrid, metallic, coppery taste in mouth; sense of constriction in throat; burning heat in esophagus and stomach; colicky pains; mucous, bilious, bloody vomiting; mucous, serous, bloody, straining stools; lips and tongue white and swollen, perhaps shriveled; breath fetid; pulse small, frequent, irregular; face swollen and flushed or anxious and pinched; extremities cold; convulsions; coma; collapse; death. Pain may be absent. Skin eruption (Eczema Mercurial) if symptoms are protracted. Secondary symptoms are coppery taste in mouth; foul breath; swollen, tender, dark-red colored gums; hectic fever; teeth sticky; tongue swollen and thickly furred; breath offensive; salivation. In salivation the saliva may be increased from a pint to $1\frac{1}{2}$ pints in a day. There may be a mercurial tremor.

TREATMENT:

1. **Evacuate the stomach if vomiting has not already occurred;** syphon out the stomach with a stomach-tube, using plenty of water. If stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 10 to 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($1/10$ grain, repeated every 15 minutes until effective). After giving the emetic, give plenty of luke-warm water to encourage vomiting.

2. Stir up **white of egg** in water or milk (whites of 4 eggs to 1 quart) and give when begin to wash out stomach. **If poisoned by Corrosive Sublimate, avoid excess of albumin, as the Albuminate of Mercury formed by the white of egg becomes soluble in an excess of the latter, also in the alkaline contents of the intestines, and may be absorbed. Give white of 1 egg for every 4 grains of Corrosive Sublimate taken.** If eggs not at hand, give finely chopped raw lean meat, mixed up in milk or water; or wheat flour and milk, or Magnesia. May mix flour in water and give, if eggs, meat or milk not at hand. After giving albumin, milk, or flour, again evacuate stomach, washing out thoroughly if possible.

Give Potassium Iodide (10 to 20 grains in 2 tablespoonfuls of water every 2 to 4 hours).

3. **Stimulate heart, circulation, and respiration** with Brandy or Whisky (2 teaspoonful doses by mouth every 10 to 15 minutes, or $1/4$ teaspoonful hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $1/4$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($1/60$ to $1/20$ grain hypodermically, every

$\frac{1}{4}$ to 2 hours) and Atropine Sulphate ($\frac{1}{120}$ to $\frac{1}{60}$ grain hypodermically, every $\frac{1}{2}$ to 2 hours), or Tincture of Belladonna (5 to 10 drops in water every 2 to 6 hours) lessens the secretion in ptyalism. Tincture of Digitalis (15 to 30 drops by mouth, or half as much hypodermically, every $\frac{1}{2}$ to 2 hours), or Digitalin ($\frac{1}{100}$ grain hypodermically, every $\frac{1}{2}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour), and inhalations of Amyl Nitrite (3 or 5 minim pearl crushed in handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary), may be used as stimulants. Draughts of strong coffee may also be given. **Also give demulcents.**

4. **Employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body), to maintain bodily temperature.

5. **Give Opium** (Powdered Opium, 1 or 2 grains every $\frac{1}{2}$ to 2 hours; or Laudanum, 20 drops every $\frac{1}{2}$ to 2 hours by mouth, or $\frac{1}{2}$ teaspoonful in gruel by rectum as frequently), or Morphine Sulphate ($\frac{1}{4}$ grain by mouth, or hypodermically, every $\frac{1}{2}$ to 2 hours), to relieve pain and nervous irritability.

6. **Bismuth, Dilute Nitric Acid** in water, or **Tannin** are useful as gargles and mouth washes for salivation.

MORPHINE.

(See Opium).

NAPHTHA.

(See Petroleum).

NAPHTHALIN.

SYMPTOMS:

Depression; cyanosis; twitching; strangury; dark-brown changing to inky-black urine.

TREATMENT:

1. **Evacuate the stomach:** syphon out the stomach with a stomach-tube, using plenty of water. If stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 10 to 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically (1/10 grain, repeated every 15 minutes until effective). After giving the emetic, give plenty of luke-warm water to encourage vomiting.

2. **Give demulcents** (such as white of egg, milk, oil, flaxseed or elm tea, barley, gum arabic or starch water, oatmeal gruel, or even crushed bananas), to soothe and protect the irritated or inflamed surfaces.

3. **Stimulate heart, circulation, and respiration** with Brandy or Whisky (2 teaspoonful doses by mouth every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate (1/60 grain hypodermically every $\frac{1}{4}$ to 2 hours) and Atropine Sulphate (1/120 to 1/60 grain hypodermically every $\frac{1}{2}$ to 2 hours), or Tincture of Belladonna (20 drops in water every $\frac{1}{2}$ to 2 hours). Tincture of Digitalis (15 to 30 drops by mouth, or half as much hypodermically, every $\frac{1}{2}$ to 2 hours), or Digitalin (1/100 grain hypodermically every $\frac{1}{4}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary), may be used for the same purposes. Draughts of strong coffee may also be given.

NICOTINE.

HISTORY:

A liquid alkaloid obtained from tobacco. Has been used for suicide and murder. Is a very deadly poison, death occurring in some instances in a few minutes.

The fatal dose of Nicotine for an adult not accustomed to tobacco is placed at about 1/10 of a drop. It is one of the most deadly poisons known, causing death in 3 minutes; but death has been delayed for hours. (See Tobacco).

NITROBENZENE (NITROBENZOL, ESSENCE OF MIRBANE, ARTIFICIAL OIL OF BITTER ALMONDS).

HISTORY:

A pale yellow oily fluid resembling in odor that of bitter almonds and because of its odor is added sometimes to sweetmeats, liqueurs or pomades. Its fumes, swallowing it, or only applying it to the skin, may poison. Workers in anilin dyes are exposed to danger from handling it. It is the solvent in many liquid shoe blackings and may poison by being absorbed. It is a powerful narcotic; effects similar to those of Prussic Acid.

Fatal Dose: 8 to 15 drops is considered a fatal dose; or merely tasting the fluid. Death from asphyxia.

SYMPTOMS:

The symptoms may not appear promptly, but may be strangely delayed for a day or two. Languor; numb feeling in head; confusion of mind; nausea; anxiety; cyanosis; dark nails, lips, tongue and mouth; dilated pupils; convulsions. Coma.

TREATMENT:

When swallowed.

1. **Evacuate the stomach:** syphon out the stomach with a stomach-tube, using plenty of water. If

the stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 10 to 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($1/10$ grain, repeated every 15 minutes until effective). After giving the emetic, give plenty of luke-warm water to encourage vomiting.

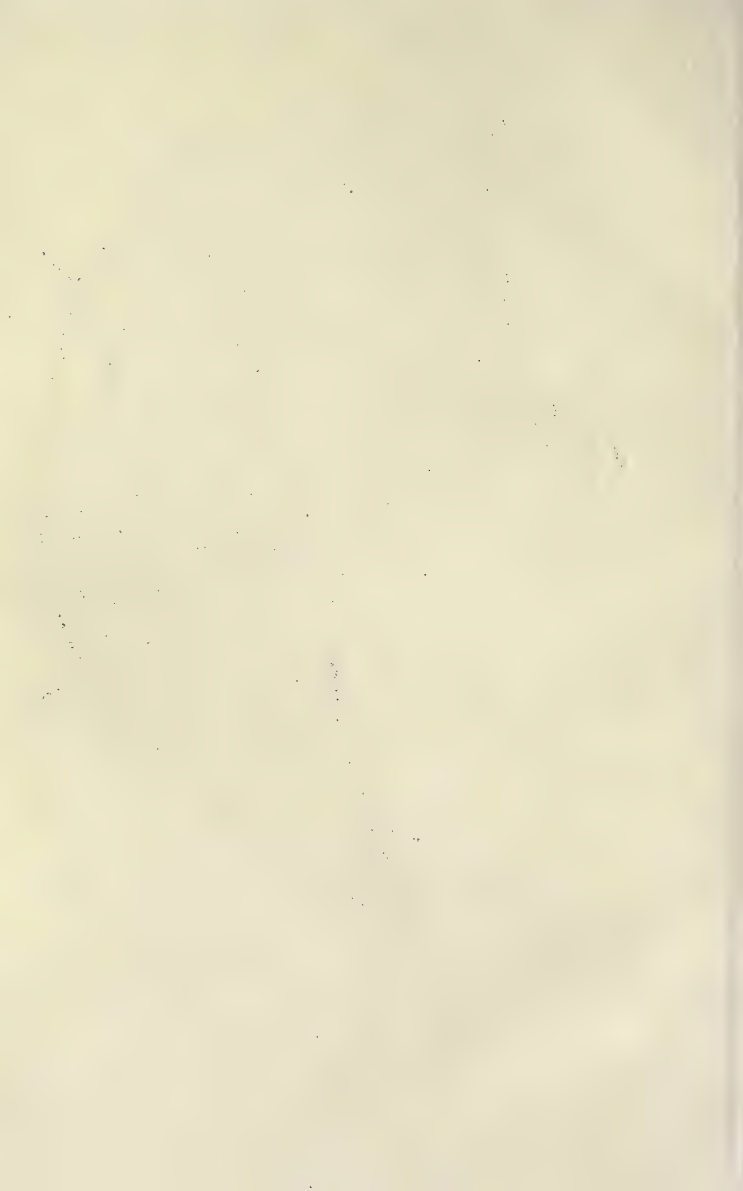
Then give **Ammonium Carbonate** (2 to 10 grain doses every 2 to 4 hours in much water), or Spirit of Mindererus ($1/2$ to 1 tablespoonful in water every 2 to 4 hours), or

2. **Stimulate heart, circulation and respiration** with Aqua Ammonia ($1/2$ teaspoonful in a cupful of water), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $1/4$ teaspoonful hypodermically as frequently), or with Chloric Ether ($1/2$ teaspoonful in water every 15 to 30 minutes), or give these as enema; also with Strychnine Sulphate ($1/60$ grain hypodermically every $1/4$ to 2 hours) and Atropine Sulphate ($1/120$ to $1/60$ grain hypodermically, every $1/2$ to 2 hours), or Tincture of Belladonna (20 drops in water every $1/4$ to 2 hours). Tincture of Digitalis (15 to 30 drops by mouth, or half as much hypodermically, every $1/2$ to 2 hours), or Digitalin ($1/100$ grain hypodermically, every $1/4$ to 1 hour), or Caffein Citrate (1 to 4 grains every $1/4$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $1/4$ to 1 hour if necessary), or inhalations of Ammonia may be given for the same purposes. Draughts of strong coffee may also be given. The transfusion of a normal saline solution (a heaping teaspoonful of salt to 1 quart of water, used at 110° F.) may prove serviceable.



APPEARANCE
OF STOMACH
IN POISONING BY
**NITRIC
ACID**
(BRUNDAGE)

See pages 73, 302



3. **Employ alternate hot and cold douche** to chest, pouring from a height. Rub body.

4. **Employ artificial respiration** if necessary (by rhythmically raising arms extended at sides to up over head and back 18 times a minute) until recovery results or cardiac pulsation is lost.

5. **Give oxygen.** Use normal salt solutions per rectum.

6. **Employ interrupted current of electricity** over heart region and to chest walls. Flagellate.

When inhaled : omit No. 1.

NITRIC ACID.

(See Acids, Mineral.)

NITRITES.

(See Amyl Nitrite.)

NITROGLYCERINE.

HISTORY :

Is used as a remedy for neuralgia, angina pectoris, and various cardiac affections; has been taken by mistake for a beverage.

Fatal dose : two mouthfuls of crude Nitroglycerine caused death; 1/50 m. severe headache.

SYMPTOMS :

Throbbing headache, increased by motion; "queer" feeling in head; pulsation all over body, even to the tips of the fingers; mental confusion; giddiness; sense of constriction in throat; irregular pulse; muscular weakness; precordial pain; dilated pupils; flushed face; anxiety; scanty, pigmented urine; sudden collapse; sometimes nausea and loss of consciousness; also symptoms characteristic of the Nitrites.

TREATMENT :

Emetics and cathartics. Recumbent position. Apply to head, cloths containing ice or wrung out in ice water. Give Brandy (1 to 4 teaspoonful doses). Give Strychnine Sulphate (1/60 to 1/20 grain hypodermically every 1/4 to 2 hours) and Atropine Sulphate (1/120 to 1/60 grain hypodermically, every 1/2, to 2 hours), or Tincture of Belladonna (20 drops in

water every $\frac{1}{4}$ to 2 hours). As a rule the Belladonna relieves the headache. Also give Fluid Extract of Ergot ($\frac{1}{4}$ to 1 teaspoonful in water, repeated in 15 to 30 minutes, by mouth, or half as much, or a grain of Ergotin, hypodermically). Also coffee for headache.

NITROUS OXIDE.

(See Anesthetics).

NUX VOMICA (STRYCHNOS NUX VOMICA, POISON NUT, QUAKER BUTTONS, RAT'S BANE) — STRYCHNOS IGNATII — STRYCHNINE — BRUCINE.

HISTORY:

Poisoning may result from swallowing a vermin killer containing meal or flour with strychnine, and perhaps arsenic also. Game killed with Strychnine may poison. The drug is used for both suicide and murder. It has been taken by mistake for Santonine, for Salicin, etc. Brucine may be physiologically considered a Dilute Strychnine.

Fatal dose: Powdered Nux Vomica, 30 grains. (One seed weighs about 30 grains—sufficient quantity to cause death). Extract of Nux Vomica, 3 grains. Death may occur from Nux Vomica in from 15 minutes to 12 hours. Three grains of Strychnine are usually fatal, and $\frac{1}{6}$ of a grain has caused death; $\frac{1}{16}$ of a grain hypodermically has produced alarming symptoms. It is probable that $\frac{7}{10}$ of a grain hypodermically would produce death; $\frac{1}{16}$ of a grain by mouth killed a child 2 years old in 4 hours; a recovery in an adult from 20 grains after prompt emetic; Dr. Warner died in 20 minutes from $\frac{1}{2}$ grain (likely to kill), taken by mistake.

Death or recovery is usually speedy. There is hope of recovery if the patient lives over 5 or 6 hours. Fatal results have occurred in 5 minutes.

There was death after 6 hours in a case where 6 grains of Strychnine were given with some Morphine. Average fatal dose Strychnine about $1\frac{1}{2}$ gr. Death in $1\frac{3}{4}$ hrs. from $\frac{1}{4}$ grain.

Death, from suffocation or exhaustion, usually in about 1 or 2 hours from beginning of symptoms.

The taste of Strychnine is intensely bitter and a dilution of 1 part in 100,000 may still be recognized by its bitter taste.

SYMPTOMS:

A sense of suffocation and difficulty in breathing; sudden muscular rigidity; stiffness about the neck; uneasy startings and sense of impending death, followed by tetanic convulsions, which come on in paroxysms varying in intervals from 3 to 30 minutes; lasting from 1 to 5 minutes or longer; opisthotonos; limbs rigid, head bent back, body stiffened and arched, resting on head and heels, with everted feet, during paroxysm—sometimes the arching is forward and sometimes it is sideways; convulsions produced by a slight touch, breath of air, or noise; between convulsions a complete relaxation; face dusky from difficulty in breathing; eyeballs prominent and pupils dilated during paroxysm; lips livid; a peculiar grin (*risus sardonicus*), corners of mouth drawn back; eyes fixed, widely opened; great thirst but inability to drink from spasms of jaws; respiration suspended during convulsion, patient quite conscious; often great anxiety; sometimes convulsive screams; cramp-like muscular contractions; pulse feeble and very rapid during paroxysm; involuntary defecation and urination; lock-jaw late in poisoning; death. (Distinguish from idiopathic or traumatic tetanus).

TREATMENT:

N. B. — Put patient in horizontal position in a dark room, free from all noise.

1. Give animal charcoal (*ad libitum*), or Tannic Acid (30 grains in a small wineglassful of water),

which forms a very insoluble tannate; or Iodine (1 to 2 grains) and Potassium Iodide (5 to 10 grains) in water (a small wineglassful), or strong tea, or a decoction of oak bark ($\frac{1}{2}$ ounce to a gill of water); follow by syphonage, the stomach-pump, or an emetic if spasms have not set in.

Potassium Permanganate (in 10 grain doses in a pint of water and repeated in 2 hours) is said to be a good antidote. Also Iodide of Starch.

2. **Evacuate the stomach QUICKLY:** Syphon out the stomach repeatedly with warm water, using a stomach-tube. If tube is not at hand, use the stomach-pump, or give an emetic, such as Zinc Sulphate 20 grains in 2 tablespoonfuls of water, repeated in 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically $\frac{1}{10}$ grain, repeated every 15 minutes until effective). After giving emetic, always give plenty lukewarm water to encourage vomiting. **After tetanic symptoms have begun, any attempt to introduce stomach-tube or use an emetic, would only bring on paroxysm and be useless.**

3. **Give Spirit of Nitrous Ether** (a teaspoonful). **Catheterize frequently** to prevent reabsorption.

4. **Give inhalations of Chloroform or Ether to control the spasms; or give Chloral** (20 to 30 grains in water by mouth or twice as much by rectum, every $\frac{1}{2}$ to 2 hours), or **Potassium Bromide** (1 to 2 drachms in water every $\frac{1}{4}$ to 1 hour by mouth, or $1\frac{1}{2}$ to 2 drachms by rectum), or both Chloral and Bromide, keeping patient gently narcotized during several hours if necessary. Give Atropine Sulphate ($\frac{1}{120}$ to $\frac{1}{60}$ grain hypodermically every $\frac{1}{2}$ to 2 hours), or Tr. Belladonna in 20 drop doses every $\frac{1}{4}$ to 2 hours. Inhalations of Amyl Nitrite (3 or 5 minim pearl crushed

in handkerchief and inhaled, using one every 10 to 15 minutes if necessary), Curare (in $1/20$ to $1/6$ grain doses hypodermically), Calabar Bean (in form of Physostigmine Sulphate, $1/100$ to $1/50$ grain every $1/4$ to 2 hours), Paraldehyde ($1/2$ to 1 teaspoonful in sweetened water every $1/2$ to 2 hours) and Urethane (in 5 to 30 grain doses in water every $1/2$ to 1 hour) also highly recommended. **Strong tea relieves thirst.**

Important! For threatened death from embarrassed respiration, should promptly resort to **artificial respiration** (rhythmically raise and lower arms from extended position at sides to up over head and back again, 20 times a minute), if possible.

OPIUM — LAUDANUM — CODEINE — MORPHINE, HEROIN — NARCEINE — POPPY — LACTUCARIUM, ETC.

HISTORY:

Poisoning has resulted from an infusion or decoction of seeds, capsules or leaves of the poppy, also the blossoms and fruit of the red poppy, also from the official and other preparations of Opium. Poisoning has resulted from enemata, lotions, poultices, and suppositories containing Opium or its preparations. Children are very susceptible to Opium and its preparations. "Godfrey's Cordial," "Dalby's Carminative," "Battley's Solution" and "Black Drop" may be classed under Opium and its preparations. Opium is quite often employed for the commission of suicide, also of murder.

Fatal dose: 4 grains is the smallest fatal dose of Opium recorded, but larger doses have been recovered from; Laudanum, 1 drachm; Extract of Opium, $2\frac{1}{2}$ grains (equal to 5 grains of Opium); Morphine Hydrochlorate, 1 grain. $1/6$ to $1/2$ of a grain of Morphine subcutaneously produced fatal results. Recovery from even 4 or 5 ounces of Laudanum; also from 2 drachms of Morphine. Infants have died from

such small doses as $1/90$, $1/15$ and $1/8$ of a grain of Opium, or 2 or 3 drops of Laudanum; 1 drop equivalent to about $1/12$ grain of Opium, killed an infant 7 days old; 2 grains of Morphine Acetate subcutaneously injected in a man with rabies produced but little effect. Tetanus, Strychnine, convulsions, great pain, or Opium habit, make nervous system very tolerant of Opium. De Quincey used 9 ounces of Laudanum daily (equal to 360 grains of solid Opium). Death has occurred from Morphine applied to an abraded surface.

In Opium poisoning, death, as a rule, usually takes place in from 7 to 12 hours. The shortest period recorded is $3/4$ of an hour: the longest 4 days. If the patient survives for 12 hours, the chances of recovery are considered good.

The symptoms of Morphine poisoning appear in from $1/4$ to 1 hour, and a fatal result may occur in $3/4$ of an hour, but as a rule not until 8 or 10 hours after the poison was taken.

SYMPTOMS:

Mental excitement; increased heart action; headache; weariness; weight in limbs; drowsiness; diminished sensibility; then deep sleep; contracted pupils (perhaps to a pin point); then face becomes reddened, suffused, or bluish; consciousness entirely lost; at first difficult, later impossible, to arouse patient; reflexes lost; jaw falls; cyanosis; respiration stertorous and puffing, shallow, slow, difficult, irregular; muscular relaxation; cold, clammy sweat; pulse rapid, weak, compressible; coma; death. Early vomiting and free perspiration are favorable symptoms. The prognosis is the less favorable the more strongly the pupils are contracted.

[In conjunction with the preceding symptoms investigate the history of the case; notice the odor of the breath and of the vomited matter, and examine the urine for Morphine. Remember Alcohol and Opium in some form are frequently taken

together. See if pupils are normal or dilated and conjunctiva congested as occurs in alcoholism, or if the pupils are contracted and insensible to light as occurs in Opium poisoning, or unequal as in apoplexy. In apoplexy, paralysis of facial muscles or limbs and the cardiac and vascular condition aids in the diagnosis. In Chloroform or Ether poisoning the vomited matter or breath usually reveals the poison by the odor; and in poisoning by drinking Chloroform is death-like aspect of face and widely dilated pupils. In uræmic poisoning, the history of the case, examination of the urine and equal pupils (dilated or normal, with puffy eyelids), indicate the poisoning. In diabetic coma, the characteristic apple or pear odor may be detected on the breath, and sugar found in the urine].

TREATMENT:

Immediately resort to artificial respiration and stimulation in the most urgent cases.

1. Evacuate the stomach: syphon out the stomach with a stomach-tube, using plenty of water. If a stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 10 to 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains, or Syrup of Ipecac, a teaspoonful, every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically (1/10 grain, every 15 minutes until effective), if narcosis has not set in. After emetic, give water to encourage vomiting. Thoroughly wash out stomach. (Morphine given hypodermically, enters stomach).

While syphoning the stomach, or when giving emetic, or even before, give Potassium Permanganate (10 grains in a pint of water, repeated in 1/2 hour; or 1 or 2 grains in 1/2 pint of water, repeated every 1/2 hour and 3 or 4 times), to oxidize the poi-

son. This drug has seemingly proved effective even when Morphine had been taken hypodermically. It is said that 6 grains of the Permanganate will neutralize an ounce of Laudanum. It has been proposed to add 2 teaspoonfuls of Dilute Acetic Acid or of White Vinegar to the antidote to change the Morphine into a soluble salt.

The hypodermic injection of Potassium Permanganate solution is believed to have proved beneficial in some cases. (Inject 15 minims of a grain to the $\frac{1}{2}$ ounce solution every 15 minutes.)

When Potassium Permanganate has been introduced into the stomach in treatment, it should afterwards be removed by syphon or emetic. If Potassium Permanganate is not at hand, give Tannic Acid (30 grains in a wineglassful of water), or Gallic Acid (the same amount), or copious draughts of strong tea, to make all the alkaloids insoluble. Animal Charcoal (a tablespoonful or more, preferably dry) may be given to precipitate or absorb the alkaloids. When the stomach has been evacuated well introduce a pint of hot, strong coffee and leave it there.

2. **Administer Atropine Sulphate**, hypodermically ($\frac{1}{120}$ to $\frac{1}{90}$ grain every 15 minutes, 3 times, or until respirations number 8 per minute), or Tincture of Belladonna by mouth or hypodermically (10 to 20 drops in water every 15 to 30 minutes, 2 or 3 times). It is said that $\frac{1}{20}$ grain of Atropine will antagonize 1 grain of Morphine, and 2 to 3 drachms of Laudanum. **Atropine or Belladonna should be given very cautiously in this kind of poisoning and not until the pupils dilate (therefore not depending upon such effect as a guide), lest poisoning by either result. Guide is respirations.**

3. Arouse patient with inhalations of Ammonia Water or smelling salts cautiously employed.

4. **The patient should be further aroused and kept awake** by means of shaking, pinching, slapping with a wet towel, dashing cold water on face and chest, or alternate hot and cold, over his head from a height, frequently repeated, drying patient in the

intervals. Avoid applying so much cold water as to cause collapse. Alternately hot water and ice to the nape of the neck helps. Walking between attendants often helps to arouse and stimulates lagging circulation, but **avoid walking patient so much as to use up vitality.** Arouses to flagellate soles of feet.

Tincture of Capsicum (1 to 2 tablespoonfuls in water) by rectal injection sometimes almost instantly relieves the stupor. **Lemon or Orange Juice**, or **Cream of Tartar in water**, every 10 minutes, antagonizes the narcotism. Avoid vinegar and Acetic Acid.

5. **Oxygen inhalations** are frequently of great value; also **faradization of chest muscles** (anode placed over root of phrenic nerve, cathode 3 inches below ensiform cartilage), or of the extremities.

6. **Stimulate heart, circulation, and respiration** with **Strychnine Sulphate** ($1/60$ to $1/20$ grain hypodermically every $1/4$ to 2 hours), or **Tincture of Digitalis** (15 to 30 drops by mouth, or half as much hypodermically, every $1/4$ to 2 hours), or **Digitalin** ($1/100$ grain hypodermically every $1/4$ to 1 hour). **Caffein Citrate** (1 to 4 grains every $1/4$ to 1 hour), and inhalations of **Amyl Nitrite** (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $1/4$ to 1 hour if necessary), are highly recommended for the same purposes. Plenty of strong **coffee** may well be given frequently by mouth, but an enema of a pint, introduced hot, is often very beneficial. (Although Brandy, Whisky, Ether or Camphor hypodermically are sometimes resorted to for failing circulation and respiration, as a rule it is better to avoid their use, owing to their effects upon the brain, etc.) May use **Cocaine** ($1/4$ gr. hypoderm.)

7. **Give Sweet Spirit of Nitre** (1 teaspoonful in a wineglassful of water every $1/2$ hour) to aid elimination of the poison by the kidneys. Evacuate the bladder frequently to prevent reabsorption of the poison. **Pilocarpine** aids elimination.

8. **Employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated

applied to the feet and sides of the body), to maintain bodily temperature. Employ friction.

9. **Resort to artificial respiration** (raise extended arms from sides to up over the head and back again 18 times a minute) if breathing stops or becomes very labored. Should be kept up for 2 hours if in doubt.

PARALDEHYDE.

HISTORY:

Has been recommended as a substitute for Chloral. Odor of drug in breath and urine.

Fatal dose: 1 drachm has produced serious symptoms. Recovery from $3\frac{1}{2}$ ounces. Unconsciousness may last for more than 30 hours. Death by paralysis of respiratory centres.

SYMPTOMS:

Slight stimulation; excited; incoherent; muscular relaxation; rapid pulse; pupils contracted and insensible to light; insensibility; collapse.

TREATMENT:

1. **Evacuate the stomach;** syphon out the stomach with a stomach-tube, using plenty of water. If a stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 10 to 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains, or Syrup of Ipecac, a teaspoonful, every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($1/10$ grain, repeated every 15 minutes until effective). After giving the emetic, give plenty of luke-warm water to encourage vomiting.

2. **Give Atropine** ($1/120$ grain hypodermically every $1/4$ to 1 hour, 2 or 3 times), or Tincture of

Belladonna (10 to 15 drops every $\frac{1}{4}$ to 1 hour, for 2 or 3 doses), or Strychnine Sulphate ($\frac{1}{60}$ to $\frac{1}{20}$ grain doses hypodermically every $\frac{1}{2}$ to 2 hours). Employ electric battery if necessary.

3. **Employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body).

4. **Oxygen.** If required, artificial respiration.

PARIS GREEN.

(See Arsenic).

PEACH KERNELS.

(See Hydrocyanic Acid).

PETROLEUM — ROCK OIL — PARAFFIN OIL (KEROSENE, MINERAL OIL, COAL OIL) — GASOLINE — BENZINE — NAPHTHA—RHIGOLENE—ETC.

HISTORY:

Petroleum or the products of its distillation have been accidentally drunk for ginger beer and other beverages with serious results. 3 ounces of Naphtha (the kind usually burned in lamps) killed a boy 12 years of age. Recovery after swallowing a pint of Petroleum and $\frac{1}{2}$ pint of Paraffin. Poisoning easily recognized from smell of breath and vomited matters. The prognosis is good.

SYMPTOMS:

Severe burning in mouth and stomach; stools covered with oily layer; cold skin; feeble pulse; sighing respiration; pale, anxious face; great thirst and restlessness at night; unconsciousness.

TREATMENT:

1. **Evacuate the stomach;** syphon out the stomach with a stomach-tube, using plenty of water. If

a stomach-tube is not at hand, give an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 10 to 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains, or Syrup of Ipecac, a teaspoonful, every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($1/10$ grain, repeated every 15 minutes until effective). After giving the emetic, give plenty of luke-warm water to encourage vomiting.

2. Stimulate heart, circulation, and respiration with Brandy or Whisky (2 teaspoonful doses by mouth every 10 to 15 minutes, or $1/4$ teaspoonful doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $1/4$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($1/60$ grain hypodermically every $1/4$ to 2 hours) and Atropine Sulphate ($1/120$ to $1/60$ grain hypodermically every $1/2$ to 2 hours), or Tincture of Belladonna (20 drops in water every $1/2$ to 2 hours). Tincture of Digitalis (15 to 30 drops by mouth, or half as much hypodermically, every $1/2$ to 2 hours), or Digitalin ($1/100$ grain hypodermically every $1/4$ to 1 hour), or Caffein Citrate (1 to 4 grains every $1/4$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $1/4$ to 1 hour if necessary), may be used for the same purposes. Draughts of strong coffee may also be given, and friction of the skin resorted to.

3. Employ artificial heat (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body), to maintain bodily temperature.

4. Resort to artificial respiration (raise extended arms from sides to up over head and back again

18 times a minute), if breathing stops or becomes very labored. Should be kept up for 2 hours if in doubt.

5. If pain is severe, give **Opium** (Powdered Opium, 1 or 2 grains every $\frac{1}{2}$ to 2 hours; or Laudanum, 20 drops every $\frac{1}{2}$ to 2 hours by mouth, or $\frac{1}{2}$ teaspoonful in gruel by rectum as frequently), or **Morphine Sulphate** ($\frac{1}{4}$ grain by mouth, or hypodermically, every $\frac{1}{2}$ to 2 hours), to relieve pain and nervous irritability.

PHENACETIN.

(See Acetanilid).

PHENOL.

(Acid Carbolic).

PHOSPHORUS—"RATSBANE"—"RAT POISON"—MATCHES.

HISTORY:

Yellow (common) Phosphorus is poisonous, luminous, and evolves a strong odor. Red Phosphorus is not poisonous, not luminous, and almost odorless. The former is used in rat-poison and both kinds for the ends of matches. Common matches are tipped with Yellow (waxy) Phosphorus mixed with Potassium Chlorate, sand, and glue. "Safety" matches are tipped only with Potassium Chlorate and Antimony Sulphide; Red Phosphorus and sizing on the containing box, for lighting. The ordinary Phosphorus rat-paste consists of Phosphorus, fat and sugar; some also contain Prussian blue as a coloring matter; others contain Arsenic as well as Phosphorus, and a common rat-paste is said to have ground glass for one of its constituents. Some vermin killers contain Strychnine.

Fatal dose: $1\frac{1}{2}$ grains of Phosphorus; $\frac{1}{9}$ grain has caused death. The chewing of two matches killed a child. Recovery after sucking 300 matches. $\frac{1}{50}$ grain of Phosphorus killed a child; $1\frac{1}{2}$ grains killed a man, and $\frac{1}{8}$ grain, a woman, inside of 12 hours. A child recovered after swallowing a drachm of rat-poison. Death occurs in from $\frac{1}{2}$ hour to 12 days; usually between the

third and seventh days. Recovery is rare. Death results from failure of circulation and respiration. Death frequently takes place suddenly. Phosphorus is more likely to cause death if finely divided or in solution than if taken in solid form.

SYMPTOMS:

The symptoms may appear in an hour or not until 3 or 4 days after the poison has been taken.

Breath smells of Phosphorus—is garlicky; Phosphorus or garlic taste in mouth; eructation of Phosphorus vapors and may be Phosphorus odor in breath; burning pain in esophagus, stomach and abdomen; inflammation of stomach and intestines; mucus, bile and blood vomited and are luminous in the dark; there may be purging or constipation; may be bloody, coffee-grounds vomit with suppression of bile; jaundice, perhaps with nettle-rash; pain in region of and liver enlarged; pupils usually dilated; temperature low; abdomen distended; twitchings; headache; vertigo; delirium; tendency to hemorrhage; albuminous, scanty urine; convulsions; coma; pseudo-menstrual discharge, abortion or miscarriage in women. The general symptoms are similar to yellow atrophy of the liver.

(The symptoms may come on in an hour or not for 3 or 4 days).

TREATMENT:

Avoid oils and fats and substances containing them, such as milk, as they increase solution and absorption of the Phosphorus. There is no known chemical antidote.

1. **Evacuate the stomach** by syphoning it out with a stomach-tube, using also, if possible, water, into which a teaspoonful of **old Oil of Turpentine** has been put. Wash thoroughly. If a stomach-tube is not at hand, may use a stomach-pump or give an emetic of Copper Sulphate (3 or 5 grains in 2 tablespoonfuls of water every 5 to 10 minutes until vomiting results). Then continue the Copper Sulphate in

1 grain doses every 15 minutes for 2 or 3 more doses. Copper Sulphate is the best emetic, inasmuch as it is believed to have some antidotal action by forming a less soluble phosphide; it is supposed to coat the particles of Phosphorus, primarily with a layer of Copper Phosphide, secondarily with Copper itself, thus preventing the solution of the Phosphorus particles in the stomach fluids.

If Sulphate of Copper is not at hand, use Zinc Sulphate (20 grains in 2 tablespoonfuls of water), or Mustard (a tablespoonful to 2 of water), may be given.

2. Give without delay **old, resinified Oil of Turpentine**, or better still, **French Oil of Turpentine** ($\frac{1}{2}$ teaspoonful or more, floated on hot water or in capsules, and repeat 3 or 4 times, at 15 to 30 minute intervals. Avoid oil, soup, milk, white of egg or other albuminous substances; also avoid mucilaginous or alcoholic drinks. If it cannot be determined what quantity of Phosphorus has been taken, the old or French Oil of Turpentine may be given in 4 doses of $\frac{1}{2}$ teaspoonful at 15 minute intervals. If the stomach will not retain the Turpentine, it has been recommended that it be injected into the rectum, atomized into the lungs, the air of the room saturated with its fumes, or that it be rubbed into the skin in the form of a liniment. The French Oil of Turpentine is quite soluble in Ether and Alcohol. Turpentine (old) forms with Phosphorus an almost insoluble mass, the so-called Turpentine-phosphoric Acid. (100 times as much Turpentine should be given as there was Phosphorus taken.) It should be given in hot water or alone (floated on the water or in capsules) immediately after the Phosphorus has been taken or as soon thereafter as possible. It is considered valueless if not given within 12 hours after.

Potassium Permanganate recommended (4 gr. in an ounce of water, frequently, or several pints of the same strength used to wash out stomach). Or 1 to 3% Hydrogen Peroxide solution may be used instead.

Lime Water freely, or Charcoal (a teaspoonful mixed in a small cupful of water) may be given to prevent action upon the tissues. If nothing else is at hand, some recommend giving Gum Arabic or Tragacanth in water to protect the stomach.

3. If the Turpentine given does not freely purge, give **Magnesium Sulphate** (Epsom Salt, 2 table-spoonfuls in small cupful of water) and Sweet Spirit of Nitre (a teaspoonful in water) or more old Turpentine (in $\frac{1}{2}$ drachm doses in mucilage every $\frac{1}{2}$ hr.).

If the bladder is inactive use a catheter frequently.

4. Give **Opium** to counteract the pain and the cardiac and systemic depression. Powdered Opium (1 to 2 grains every $\frac{1}{2}$ to 2 hours), or Laudanum (10 to 20 drops every $\frac{1}{2}$ to 2 hours by mouth, or $\frac{1}{2}$ teaspoonful in gruel by rectum as frequently), or Morphine Sulphate ($\frac{1}{4}$ grain by mouth or hypodermically every $\frac{1}{2}$ to 2 hours).

5. **Transfusion** may be necessary to repair the blood. Inhalations of highly diluted Turpentine vapor are beneficial; also of pure oxygen. Hydrogen Peroxide, given in solution or injected subcutaneously, has been highly recommended.

6. **Magnesia**, Milk of Magnesia, Chalk, or Lime suspended in gruel have been recommended. After acute symptoms over, give Sodium Carbonate freely for acid intoxication. Apply heat to feet and body.

PHYSOSTIGMA.

(See Calabar Bean).

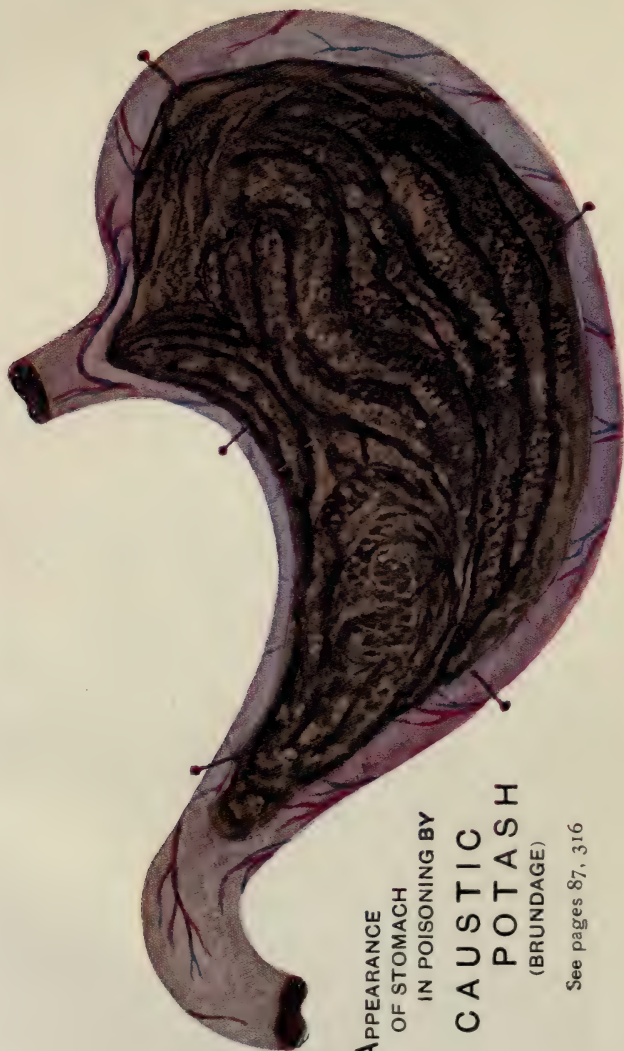
PHYTOLACCA (POKE BERRY, POKE ROOT).

SYMPTOMS:

Nausea; vomiting; slowing of heart and respiration; depression; convulsions.

TREATMENT:

1. Vomiting and purging are frequently produced by the poison, but syphoning out the stomach with stomach-tube and much water is desir-



APPEARANCE
OF STOMACH
IN POISONING BY
**CAUSTIC
POTASH**
(BRUNDAGE)

See pages 87, 316

able. If evacuation does not occur, give Apomorphine Hydrochlorate, hypodermically ($\frac{1}{10}$ grain every 10 or 15 minutes until effective), or Mustard (a tablespoonful in a small cupful of water).

2. Stimulate. Give Brandy or Whisky (2 teaspoonful doses by mouth every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful doses hypodermically as frequently), or Aromatic Spirit of Ammonia (a teaspoonful in water every 10 to 15 minutes), or Compound Spirit of Ether ($\frac{1}{2}$ to 2 drachm doses in water every 10 to 20 minutes). Support heart with Tincture of Digitalis (10 to 20 drops in water every $\frac{1}{2}$ to 2 hours), or Digitalin ($\frac{1}{100}$ to $\frac{1}{50}$ grain doses hypodermically every $\frac{1}{2}$ to 2 hours).

3. Give Opium (Powdered Opium, 1 to 2 grains every $\frac{1}{2}$ to 2 hours), or Laudanum (20 drops every $\frac{1}{2}$ to 2 hours by mouth, or $\frac{1}{2}$ teaspoonful in gruel by rectum as frequently), or Morphine Sulphate ($\frac{1}{4}$ grain by mouth or hypodermically every $\frac{1}{4}$ to 2 hours), to relieve pain and nervous irritability.

PICROTOXIN.

(See *Cocculus Indicus*).

PILOCARPINE.

(See *Jaborandi*).

PINK ROOT.

(See *Spigelia*).

POKE.

(See *Phytolacca*).

POISON OAK OR POISON VINE.

(See *Rhus*).

POPPY.

(See *Opium*).

POTASSIUM,—CAUSTIC POTASH.

(See *Alkalies*).

POTASSIUM CHLORATE—Chlorates—Nitrates.

HISTORY:

Fatal dose: from $\frac{1}{2}$ ounce upward, in $\frac{1}{4}$ to 7 days.

SYMPTOMS:

Poisonous doses interfere with the oxygenation of the blood corpuscles and produce toxic hæmoglobinuria. Evidences of severe irritation of the alimentary canal and of the nervous system; severe dyspnœa; cyanosis; the skin usually jaundiced; delirium; coma. Acute tubal nephritis is produced; the excretion increased, but its chemical reaction unchanged.

TREATMENT:

1. **Evacuate the stomach:** syphon out the stomach with a stomach-tube, using plenty of water. If a stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($\frac{1}{10}$ grain, repeated every 15 minutes until effective). After giving emetic, always give plenty of lukewarm water to encourage vomiting.

2. **Give demulcents** (such as white of egg, milk, oil, gum arabic, flaxseed or elm tea, gelatin, flour and water, barley or starch water, oatmeal gruel, or even crushed bananas) to soothe and protect the irritated and inflamed surfaces.

3. **Employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body) to maintain bodily temperature.

4. **Give Opium** (Powdered Opium, 1 to 2 grains every $\frac{1}{2}$ to 2 hours; or Laudanum, 20 drops every $\frac{1}{2}$ to 2 hours by mouth, or $\frac{1}{2}$ teaspoonful in gruel by rectum as frequently), or Morphine Sulphate ($\frac{1}{4}$ grain by mouth, or hypodermically every $\frac{1}{2}$ to 2 hours), to relieve pain and nervous irritability.

Employ inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary).

Avoid stimulants, or anything likely to increase the congestion of the kidneys.

PRECIPITATE, RED OR WHITE. (See Mercury).

PTOMAINES (PUTREFACTIVE, CADAVERIC OR ANIMAL ALKALOIDS).

HISTORY:

Ptomaines are alkaloidal or basic products of the putrid decomposition of animal or vegetable matter. Many of the Ptomaines respond to most of the ordinary reactions of the vegetable alkaloids, thus leading to confusion or error in toxicological investigations. Not all Ptomaines are poisonous, and quite often that which is called Ptomain-poisoning is really due to a mixture of substances containing no recognized causative Ptomaine. Such poisoning should be considered as a **food poisoning** (q. v.).

The reactions of certain Ptomaines duplicate the actions of the following alkaloids: Atropine, Colchicine, Coniine, Delphinine, Digitalin, Nicotine, Strychnine and Veratrine.

SYMPTOMS:

The substances which produce symptoms very much like those of Atropine are called Ptomatropines. They have been found in corned beef, poisonous sausage, decaying fish, and putrid game.

They cause dryness of the mouth, great thirst, red and swollen gums, dilated pupils, drooping eyelids; occasionally loss of voice, great weakness; there may be chills, vomiting, diarrhœa, offensive, dark-colored stools, temperature 101 to 104, convulsions and even death from paralysis of the heart. Post mortem examinations may show congestion of brain, lungs and kidneys, etc.

Oily, alkaline, volatile substances resembling Coniine in their reactions have been discovered in decomposing animal tissues.

The reactions and physiological effects of certain ptomaines from corn meal are somewhat similar to those of Strychnine.

Digitalin-like substances have been discovered in liver sausage.

A substance giving most of the reactions of Colchicine has been found in beer.

Poisons formed during putrefaction.

Tyrototoxin is said by some to be a poisonous proteid allied to the tetanus and diphtheria toxins; by others a ptomaine, and found at times in stale milk, cheese, ice-cream and certain milk products.

Tyrototoxin produces vomiting, purging, rapid pulse, dilated pupils, hurried breathing, depression of temperature, prostration, and death.

Typhotoxin—a substance produced by the Eberth bacillus of typhoid fever, kills mice and guinea pigs in a day or two.

Mydaleine, found in decaying cadaveric liver, spleen, etc., causes increase in temperature when hypodermically administered.

Neurine, found in decomposing animal tissue, acts similar to Curare.

Cancroin is believed to be similar to Neurine and the active agent in producing cancer. Susotoxine, Choline, Methylguanidine, Isoamylamine, Patoamine, Trimethylenediamine, Ethylenediamine, etc., also cause more or less serious symptoms or death.

TREATMENT:

Treat as in Poisonous Foods (q. v.).

PULSATILLA.**HISTORY:**

Death by paralysis of heart.

SYMPTOMS:

Reduced heart action, respiration, and temperature; pupils dilated; motion and sensation paralyzed.

TREATMENT:

1. **Evacuate** the stomach: syphon out the stomach with a stomach-tube, using plenty of water. If the stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 10 to 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically (1/10 grain, repeated every 15 minutes until effective). After giving the emetic, give plenty of luke-warm water to encourage vomiting.

Give Tannic Acid (in 10 to 20 grain doses).

2. **Stimulate.** Give Brandy or Whisky (2 teaspoonful doses by mouth every 10 to 15 minutes, or 1/4 teaspoonful doses hypodermically as frequently), and Tincture of Digitalis (15 to 20 drops by mouth, or half as much hypodermically, every 1/2 to 2 hours), or Digitalin (1/100 grain hypodermically every 1/4 to 1 hour).

3. **Give Opium** (Powdered Opium, 1 to 2 grains every 1/2 to 2 hours), or Laudanum, 20 drops every 1/2 to 2 hours by mouth, or 1/2 teaspoonful in gruel by rectum as frequently), or Morphine Sulphate (1/4 grain by mouth or hypodermically, every 1/4 to 2 hours), to relieve pain and tenesmus.

RAT PASTE—"ROUGH ON RATS."

(See Arsenic ; also Phosphorus).

RESORCIN.**HISTORY:**

Is used as an antipyretic and antiseptic. Very few cases of poisoning.

Fatal dose: 2 drachms have nearly caused death. Death by paralysis of respiratory centres.

SYMPTOMS:

Dizziness ; tingling sensation—"pins and needles" ; severe perspiration ; lips blanched ; dry tongue ; low temperature ; normal pupils ; black urine ; clenched teeth ; unconsciousness.

TREATMENT:

1. Evacuate the stomach ; syphon out the stomach with a stomach-tube, using plenty of water. If a stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water every 10 to 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains ; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($1/10$ grain, repeated every 15 minutes until effective). While syphoning, or after giving the emetic, give plenty of lukewarm water containing Soda or Saccharated Lime.

2. Stimulate heart, circulation, and respiration with Brandy or Whisky (2 teaspoonful doses by mouth every 10 to 15 minutes, or $1/4$ teaspoonful dose hypodermically as frequently), [**Red Wine, used freely, is considered an excellent antidote**], or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $1/4$ teaspoon-

ful hypodermically as frequently) ; also with Strychnine Sulphate ($1/60$ to $1/20$ grain hypodermically every $1/4$ to 2 hours) and Atropine Sulphate ($1/120$ to $1/60$ grain hypodermically every $1/2$ to 2 hours), or Tincture of Belladonna (20 drops in water every $1/4$ to 2 hours). Tincture of Digitalis (15 to 30 drops by mouth, or half as much hypodermically, every $1/2$ to 2 hours), or Digitalin ($1/100$ grain hypodermically every $1/4$ to 1 hour), or Caffein Citrate (1 to 4 grains every $1/4$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $1/4$ to 1 hour if necessary), may be used for the same purposes. Draughts of strong coffee may also be given.

3. **Give demulcents** (such as white of egg, milk, oil, flaxseed or elm tea, barley, gum arabic or starch water, oatmeal gruel, gelatin, flour and water, or even crushed bananas), to soothe and protect the irritated or inflamed surfaces.

4. **Employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body), to maintain bodily temperature.

Also employ friction and use an interrupted electric current if necessary.

RHIGOLENE.

(See Petroleum.)

RHUS—RHUS RADICANS—RHUS TOXICODENDRON (POISON VINE, POISON OAK, POISON IVY)—RHUS VENENATA (SWAMP-SUMACH, POISON-SUMACH).

SYMPTOMS :

Itching ; swelling ; vesicular eruptions ; throat may be involved, causing cough ; thirst ; vomiting ; colicky pains, with fever and delirium. (Poisoning due to active principle, a non-volatile oil called toxicodendrol, contained in the pollen, hairs, etc.).

TREATMENT:

1. **Apply lotion** of *Grindelia Robusta* (Fluid Extract of *Grindelia Robusta* 1 part, water 10 to 48 parts, mix), or of Sodium Hyposulphite, **or best an alcoholic solution of Lead Acetate.** Frequent washing with soap-suds and hot water is good. Alcohol removes the poison. A 5 per cent. aqueous solution of Cocaine promptly relieves burning and itching when applied as a lotion. A 5 per cent. solution of Carbolic Acid is also good. Infusion of *Lobelia* (1 ounce to pint), also Corrosive Sublimate solution, or Alum, good applications; also *Aristol* dusted on or *Ichthyol* applied. Give a simple diet.

2. **Give Magnesium Sulphate** (a tablespoonful in a small cupful of water). Also cooling drinks.

3. **Give Opium** (Powdered Opium, 1 to 2 grains every $\frac{1}{2}$ to 2 hours), or *Laudanum*, 20 drops every $\frac{1}{2}$ to 2 hours by mouth, or $\frac{1}{2}$ teaspoonful in gruel by rectum as frequently), or *Morphine Sulphate* ($\frac{1}{4}$ gr. every $\frac{1}{4}$ to 2 hrs. by mouth or hypodermically). **Avoid fats and oils, as they spread the poison.**

SALIVA OF RABID ANIMALS—RABIES (**HYDROPHOBIA.**) (Infection by bite.)

HISTORY:

Hydrophobia may result from the bite of dog, cat, wolf, fox or other carnivorous animal. The disease is, as a rule, fatal, death resulting in from 2 to 5 days. Shortest period on record 24 hours. Longest, 9 days.

SYMPTOMS:

Symptoms do not as a rule come on inside of 3 weeks after the bite (usually between the 20th and 120th day), and may not occur until after years, the wound being long since healed. Symptoms are: pain and uneasiness in the part bitten; restlessness; malaise; dyspnœa; difficult swallowing; fear of water; pain in the stomach, with bilious vomiting; severe convulsions; swollen, often protruding, tongue; free flow of viscid saliva; distorted face.

If the dog has an appetite after the fourth day, or dies without paralysis, rabies did not exist.

TREATMENT :

Preserve for observation the dog or other hydrophobic animal known or suspected. A positive diagnosis can thus be made in a few days, and prolonged, determinative, experimental-inoculations for diagnosis, avoided. (Early injection of antirabic serum advisable in all suspected cases, and practically harmless).

Preventive treatment when bitten: Immediately ligate above wound and apply Tincture of Iodine in and about it ; wash with hot water and suck wound to remove virus ; apply Carbolic Acid to or cauterize (not with Silver Nitrate) or excise bitten part. Ammonia Water applied benefits. Inoculate with Pasteur's hydrophobia emulsion.

TREATMENT FOR HYDROPHOBIA :

Give Chloroform (5 to 30 drops) in sugar and water. Give Morphine hypodermically ($\frac{1}{4}$ grain every 1 to 3 hours) until under influence. Rectal injections of Chloral or Potassium Bromide may be given. Spray throat with 4 per cent solution of Cocaine.

Feed per rectum with nutritive enemas and suppositories. Put patient in a dark room and keep quiet and warm. Exclude all draughts. Inoculate with Pasteur's hydrophobia emulsion.

SALT OF SORREL OR LEMON.

(See Acid Oxalic).

SANGUINARIA (BLOOD-ROOT).**HISTORY :**

Death by paralysis of cardiac and respiratory centers.

SYMPTOMS :

Severe salivation ; violent vomiting ; severe purging ; faintness ; vertigo ; coldness ; dilated pupils ; reduced temperature ; slow pulse ; great prostration ; intense thirst ; convulsions ; collapse.

TREATMENT :

1. **Evacuate the stomach:** syphon out the stomach

with a stomach-tube, using plenty of water. If a stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 10 to 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective, or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($1/10$ grain, repeated every 15 minutes until effective). After giving the emetic, give plenty of lukewarm water to encourage vomiting.

Tannic Acid (in 20 gr. doses) is recommended.

2. Stimulate heart, circulation, and respiration with Brandy or Whisky (2 teaspoonful doses by mouth every 10 to 15 minutes, or $1/4$ teaspoonful doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $1/4$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($1/60$ to $1/20$ grain hypodermically every $1/4$ to 2 hours) and Atropine Sulphate ($1/120$ to $1/60$ grain hypodermically every $1/2$ to 2 hours), or Tincture of Belladonna (20 drops in water every $1/2$ to 2 hours). Tincture of Digitalis (15 to 30 drops by mouth, or half as much hypodermically, every $1/2$ to 2 hours), or Digitalin ($1/100$ grain hypodermically every $1/4$ to 1 hour), or Caffein Citrate (1 to 4 grains every $1/4$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $1/4$ to 1 hour if necessary), may be used for the same purpose. Draughts of strong coffee may also be given.

3. Give Opium (Powdered Opium, 1 to 2 grains every $1/2$ to 2 hours), or Laudanum (20 drops every $1/2$ to 2 hours by mouth or hypodermically every $1/4$ to 2 hours), to relieve local irritant action.

SANTONIN.**HISTORY:**

About 2 grains of Santonin killed a boy $5\frac{1}{2}$ years of age in 15 hours; flower heads equal to 30 grains of Santonin killed a girl 10 years old; $1\frac{7}{10}$ grains has caused death of a child 5 years old in 15 hours.

The maximum dose for children may be said to be 1 to 2 grains, and for adults about twice as much.

Death by asphyxia.

SYMPTOMS:

Color vision is disturbed, objects first assuming a violet or bluish, then yellow tinge; ringing in ears; headache; dizziness; dilated pupils; sweating; weak pulse; abdominal pain; convulsions; stupor.

Santonin is excreted by the kidneys, coloring acid urine greenish-yellow, alkaline urine cherry-red or crimson.

TREATMENT:

1. **Evacuate the stomach:** syphon out the stomach with a stomach-tube, using plenty of water. If a stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 10 to 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($\frac{1}{10}$ grain, repeated every 15 minutes until effective). After giving emetic, give plenty of luke-warm water to encourage vomiting.

2. **Stimulate heart, circulation, and respiration** with Brandy or Whisky (2 teaspoonful doses by mouth every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful hy-

podermically as frequently); also with Strychnine Sulphate ($1/60$ to $1/20$ grain hypodermically every $1/4$ to 2 hours) and Atropine Sulphate ($1/120$ to $1/60$ grain hypodermically every $1/2$ to 2 hours), or Tincture of Belladonna (20 drops in water every $1/4$ to 2 hours). Tincture of Digitalis (15 to 30 drops by mouth, or as much hypodermically, every $1/2$ to 2 hours), or Digitalin ($1/100$ grain hypodermically every $1/4$ to 1 hour), or Caffein Citrate (1 to 4 grains every $1/4$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $1/4$ to 1 hour if necessary), may be used for the same purpose. Draughts of strong coffee may also be given. **Chloroform for convulsions.**

SAVINE.

HISTORY:

The poison is recognized by its odor. There is no reliable chemical test.

Usually poisoning by decoctions or infusion of Savine Leaves. Oil or Tincture of Savine may poison. Oil of Savine is present in the leaves to the amount of about 2 per cent.; 10 per cent. in the fruit.

Death from Savine may occur within 12 hours or be delayed for 2 or 3 days.

Death by collapse.

SYMPTOMS:

Pain in abdomen; vomiting; straining and bloody stools; difficult respiration; convulsions; coma; collapse. Sometimes severe irritation of urinary organs, such as strangury and bloody urine; odor of drug in urine; may be vomiting of blood anesthesia, uterine hemorrhage, and abortion.

TREATMENT:

1. If patient has not vomited freely, repeatedly syphon out the stomach with warm water, or give Apomorphine Hydrochlorate, hypodermically ($1/10$

grain, repeated every 15 minutes until effective). Or if the throat is not much inflamed, may give an emetic of Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated every 10 to 15 minutes until it produces vomiting), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until it acts).

2. **A dose of Castor Oil** (an ounce, i. e., 2 tablespoonfuls), or of Magnesium Sulphate (an ounce, i. e., 2 tablespoonfuls), should be given unless bowels have freely moved. Apply poultice, for abdominal pain.

3. **Give demulcents** (such as white of egg, milk, arrowroot, oil, gum arabic, flaxseed or elm tea, barley or starch water, oatmeal gruel, gelatin, flour and water, or even crushed bananas), to soothe and protect the irritated and inflamed surfaces.

4. **Stimulate heart, circulation, and respiration** with Brandy or Whisky (2 teaspoonful doses every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($\frac{1}{60}$ to $\frac{1}{20}$ grain hypodermically every $\frac{1}{2}$ to 2 hours) and Atropine Sulphate ($\frac{1}{120}$ grain hypodermically every $\frac{1}{2}$ to 2 hours), or Tincture of Belladonna (20 drops in water every $\frac{1}{2}$ to 2 hours), or Tincture of Digitalis (15 to 30 drops by mouth, or half as much hypodermically, every $\frac{1}{2}$ to 2 hours), or Digitalin ($\frac{1}{100}$ grain hypodermically every $\frac{1}{4}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour) and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary), may be used for the same purposes. Draughts of strong coffee may also be given.

5. **Employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or

bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body), to maintain bodily temperature.

6. **Give Opium** (Powdered Opium, 1 to 2 grains every $\frac{1}{2}$ to 2 hours), or Laudanum (20 drops every $\frac{1}{2}$ to 2 hours by mouth, or $\frac{1}{2}$ teaspoonful in gruel by rectum as frequently), or Morphine Sulphate ($\frac{1}{4}$ grain by mouth or hypodermically every $\frac{1}{2}$ to 2 hours), to relieve pain and nervous irritability.

SCHEELE'S GREEN.

(See Arsenic).

SCOPARIUS.

(See Digitalis).

SCORPION, ETC.

(See Insects).

SEWER GAS (CESSPOOL AND PRIVY EMANATIONS).

HISTORY:

As a rule the sewer gas and privy emanations consist of a mixture of Sulphuretted Hydrogen, Ammonium Sulphide and Nitrogen, but sometimes only of deoxidized air, with an excess of Carbonic Acid Gas.

The poisonous vapors of cesspools consist of Carbonic Acid, Sulphuretted Hydrogen and Nitrogen.

Entrance of Sewer Gas into bed-rooms, or the exposure to the emanations of cesspools in cleaning them out, have produced fatal result. Emanations from open street gratings sometimes produce serious symptoms. Sewers, cesspools, privies, etc., should be well stirred to permit the escape of the contained gas before cleaning them out. It is well also to disinfect them.

SYMPTOMS:

When the poison is concentrated, death may occur at once. If not concentrated, a few moments exposure may produce the following symptoms: Unconsciousness, which resists all attempts to relieve; lips

livid; pupils dilated and not sensitive to light; eyes fixed and turned upwards; conjunctiva injected; countenance pallid, pink or purple; may be froth issuing from the mouth.

TREATMENT:

No true antidote is known.

If there is time to do anything, fresh air, stimulation with Ammonia to the nostrils, and Aromatic Spirit of Ammonia by mouth ($\frac{1}{2}$ to 1 teaspoonful in water every 10 to 20 minutes), and Brandy or Whisky (in teaspoonful doses by mouth, or half as much hypodermically, every 10 to 20 minutes), and Strychnine Sulphate ($\frac{1}{60}$ to $\frac{1}{20}$ grain hypodermically every $\frac{1}{4}$ to 2 hours) will help. Rest is beneficial. Transfusion of blood and the introducing of a normal salt solution into the veins have proven advantageous. Chlorine water or Dilute Hydrochloric Acid and Potassium Chlorate internally, are recommended.

Give Oxygen inhalations.

SILVER COMPOUNDS (SILVER NITRATE, LUNAR CAUSTIC) — ETC.

HISTORY:

Nitrate of Silver turns black when contaminated with organic matters. It acts principally as a corrosive poison when taken internally. Prolonged administration of the Silver compounds produces a blue or gray-black indelible discoloration of the skin, beginning first around the nails and fingers. Acute poisoning is rare; usually from accidentally swallowing a piece of Nitrate of Silver stick. 30 grs. has killed.

Death commonly results from asphyxia.

SYMPTOMS:

Pain; vomiting of a white cheesy matter, which in sunlight rapidly turns black; purging; cramps; dizziness; cardiac depression; respiratory disturbance; convulsions; paralysis; coma; collapse.

TREATMENT:

1. **Give Sodium Chloride**—common salt—(a tablespoonful of salt to the pint of water or even milk) freely, as the chemical antidote. It precipitates the Silver as the insoluble and harmless chloride, and acts as an emetic. Ammonium Chloride may be used instead.

2. **Evacuate the stomach**, syphoning it out with water containing a tablespoonful of salt to the pint. If the syphon is not at hand, give Mustard (a tablespoonful in 2 tablespoonfuls of water, repeated in 10 to 15 minutes if vomiting has not resulted), Quassia tea or other bitter infusion, or greasy water (is best to avoid Zinc Sulphate after salt), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 15 minutes until it vomits), with much water. Follow with some more salt water. **Salt is the best antidote**, but white of egg and copious draughts of milk may be given with benefit, having some antidotal effect and serving as food until the stomach has recovered.

3. **Give demulcents** (as white of egg, milk, oil, gum arabic, flaxseed or elm tea, barley or starch water, oatmeal, gelatin, flour and water, or even crushed bananas), to soothe and protect the irritated or inflamed surfaces. Give Tannin, also give alkalis.

4. **Give Opium** (Powdered Opium, 1 to 2 grains every $\frac{1}{2}$ to 2 hours), or Laudanum (20 drops every $\frac{1}{2}$ to 2 hours by mouth, or $\frac{1}{2}$ teaspoonful in gruel by rectum as frequently), or Morphine Sulphate ($\frac{1}{4}$ grain by mouth or hypodermically every $\frac{1}{2}$ to 2 hours), to relieve pain and nervous irritability.

5. **If necessary, stimulate heart, circulation, and respiration** with Brandy or Whisky (2 teaspoonful doses every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate (1/60 to 1/20 grain hypodermically every $\frac{1}{2}$ to 2 hours),

and Atropine Sulphate (1/120 grain hypodermically every $\frac{1}{2}$ to 2 hours), or Tincture of Belladonna (20 drops in water every $\frac{1}{2}$ to 2 hours). Tincture of Digitalis 15 to 30 drops by mouth, or half as much hypodermically, every $\frac{1}{2}$ to 2 hours), or Digitalin (1/100 grain hypodermically every $\frac{1}{4}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary) may be used for same purposes. Draughts of strong coffee may also be given.

SNAKE VENOM—SNAKE BITE. **(The Bite of Various Poisonous Serpents.)**

(See pp. 237-8.)

HISTORY:

The venom of the viper contains albumin, albumoses and globulin, all poisonous. The venom of the cobra contains albumin, globulin and syntonin, all poisonous. One four-millionth of the body weight of cobra venom causes death. It is believed snake venom disintegrates human blood corpuscles.

Death by paralysis of cardiac and respiratory centres usually inside of 12 hours. If death occurs in a few minutes, due to thrombosis; if, under 24 hours, by paralysis of cardiac and respiratory centres; if after 24 hours, by exhaustion or sepsis. In fatal cases the blood deteriorates and will not coagulate.

Poisonous snakes are thicker than harmless ones, and the tail is shorter. They also appear rough, owing to the dorsal scales being keeled. The head is also triangular; they have a peculiar pit or depression in the upper jaw between the eye and the nose, and they have elliptical pupils. The poison is secreted by glands corresponding to the parotids in man; it is a thin yellowish fluid, varying in quantity from one drop to a drachm, according to the variety and size of the snake.

SYMPTOMS:

Symptoms more or less severe. Intense thirst, skin clammy.

Chief symptoms are: Intense shock; severe pain

in part bitten; area of pain rapidly increases; local partial paralysis; intense swelling of portion of body injured, which later becomes livid and gangrenous; fainting; vomiting; small, frequent, irregular pulse; hemorrhages; bloody stools and urine; lethargy; difficult respiration; convulsions; death.

It is thought the peptones in the venom determine the amount of local edema, the convulsions and also the paralysis of respiration: the globulins are supposed to disorganize the blood and produce hemorrhage.

TREATMENT:

1. Thoroughly suck or cup the wound; ligate above it, between the wound and the heart, using piece of rope, or even pocket-handkerchief; cut out the bitten part or cauterize it thoroughly with caustic, red hot iron or live coal, or apply strong Nitric Acid or a solution of Potassium Permanganate, or even put on Gunpowder and set fire to it. Subcutaneous injection, if possible, in orifice made by fangs or application of Potassium Permanganate (5 to 10 gr. to pint, or even 1%) solution, has been highly recommended. Also the injection about the wound, of 10 minims or more of a 10 per cent. solution of Calcium Hypochlorite, or a solution of Aurum Chloride. Elimination may be aided by inducing free perspiration or salivation by Pilócarpine Hydrochlorate ($1/100$ to $1/60$ grain hypodermically). The free application of Ammonia Water has proved efficacious. Washing wound thoroughly and then applying 25 per cent. Carbolic Acid solution recommended. Application of Tincture of Iodine advised. Also Galium Circæzans internally.

Bleeding patient on bitten limb and transfusing blood by other limb is recommended when severely poisoned by cobra.

The administration, or hypodermic injection in 15 to 20 c.c. doses for adult, children half as much, of a horse serum (one is called Antivenene) has saved lives of many persons bitten by the cobra, or other snake. Inject into abdominal cellular tissue within 2 hrs. after bite; and inject into and around bite 8 c.c. of

1:60 solution of Calcium Hypochlorite. Bile, or the water soluble portion of it, is said to be beneficial.

2. **Encourage heart action and circulation** by weak interrupted galvanic currents applied to the chest in region of the heart. Rub patient and give coffee.

3. **Give Ammonia inhalations** and stimulate with Brandy or Whisky very freely (2 to 8 teaspoonful doses or more every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful doses hypodermically as frequently), and with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful hypodermically as frequently, which, if possible, should be injected into radial vein, with equal volume of water). Strychnine Sulphate ($\frac{1}{60}$ to $\frac{1}{20}$ grain hypodermically every 10 to 20 minutes if necessary, for several doses). Some advise carry whisky to point of narcosis.

If respiration is seriously interfered with, resort to artificial respiration and maintain for several hours.

Keep patient warm, quiet and provide fresh air freely.

Transfusion of healthy blood or intravenous injection of normal salt solution may be required.

In rattlesnake bite, Olive Oil freely, both externally and internally, is by some considered a specific.

It is believed that snake-charmers render themselves immune to venom by taking small doses by the mouth.

SODA.

(See Alkalies).

SPIGELIA (PINK ROOT).

SYMPTOMS:

Vertigo; dimness of vision; dilated pupils; dry throat; convulsions; delirium.

TREATMENT:

1. **Evacuate the stomach;** syphon out the stomach with a stomach-tube, using plenty of water. If the stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 15 minutes if vomiting is not produced), or Mustard (a teaspoonful in a small cupful of water, repeated in 15 minutes if not effective), or

Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($1/10$ grain, repeated every 15 minutes until effective). After giving emetic, always give plenty of lukewarm water to encourage vomiting.

2. Stimulate heart, circulation, and respiration as described under Savine on Page 193.

SQUILL (SCILLA).

(See Digitalis.)

STRAMONIUM (JAMESTOWN WEED, THORN APPLE, DEVIL'S APPLE).

HISTORY:

100 seeds killed a child 2 years old. Recovery after $\frac{1}{2}$ ounce of the leaves infused in boiling water.

Symptoms and Treatment similar to Belladonna.

STROPHANTHUS (KOMBE ARROW POISON)—STROPHANTHIN—OUABAIN.

HISTORY:

Fatal dose: Strophanthin is three times as poisonous as Atropine, ten times as poisonous as Strychnine, and twelve times as poisonous as absolute Hydrocyanic Acid.

Death by paralysis of the heart (in systole).

SYMPTOMS:

Pulse weak; urine increased; muscular rigidity; spasms.

TREATMENT:

Recumbent position.

1. Evacuate the stomach if just taken; syphon out the stomach with a stomach-tube, using plenty of water. If the stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecac-

uanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically (1/10 grain, repeated every 15 minutes until effective). After giving emetic, always give plenty of lukewarm water to encourage vomiting.

Give Tannic Acid or Gallic Acid (30 grains in a little water).

2. **Stimulate, by the mouth**, or if vomiting persists, by the bowel. **Stimulate heart, circulation, and respiration** with Brandy or Whisky (2 teaspoonful doses every 10 to 15 minutes, or 1/4 teaspoonful doses hypodermically as frequently) or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or 1/4 teaspoonful hypodermically as frequently), or Caffein Citrate (1 to 4 grains every 1/4 to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every 1/4 to 1 hour if necessary), may be used for the same purposes. Draughts of strong coffee may also be given.

3. **Give a saline cathartic**, such as Epsom Salt, with much water.

4. **Give inhalations of Chloroform or Ether**, to secure muscular relaxation. Give Chloral as the best antagonist (30 grains in water by mouth, or twice as much by rectum) as soon as possible; then in 20 grain doses hourly while convulsive tendency continues. Potassium Bromide (a drachm in water every 1/2 to 1 hour by mouth, or 1/2 to 2 drachms by rectum) may be given, but its action is rather slow. May give both Chloral and Bromide, keeping patient gently narcotized during several hours if necessary. Inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every 1/4 to 1 hour if necessary), may be used for the same purposes.

Curare (1/20 to 1/6 grain hypodermically) and Calabar Bean (Physostigmine Sulphate, 1/100 grain

hypodermically) and Potassium Permanganate are recommended.

Also ice to spine, and a tobacco enema.

For threatened death from embarrassed respiration, resort to artificial respiration (rhythmically raising and lowering arms from straight at sides to up over head and back again, 18 or 20 times a minute).

SULFONAL—TRIONAL—TETRONAL.

HISTORY:

Death in 40 hours from two 15-grain doses Sulfonal taken in $1\frac{1}{4}$ hrs. Also death on fourth day from taking over an ounce. Recovery from 3 ozs.

SYMPTOMS:

Giddiness; weakness; tumbling and walking about unsteadily; cyanosis; suppressed urine; ptosis; may be papular skin eruption.

TREATMENT:

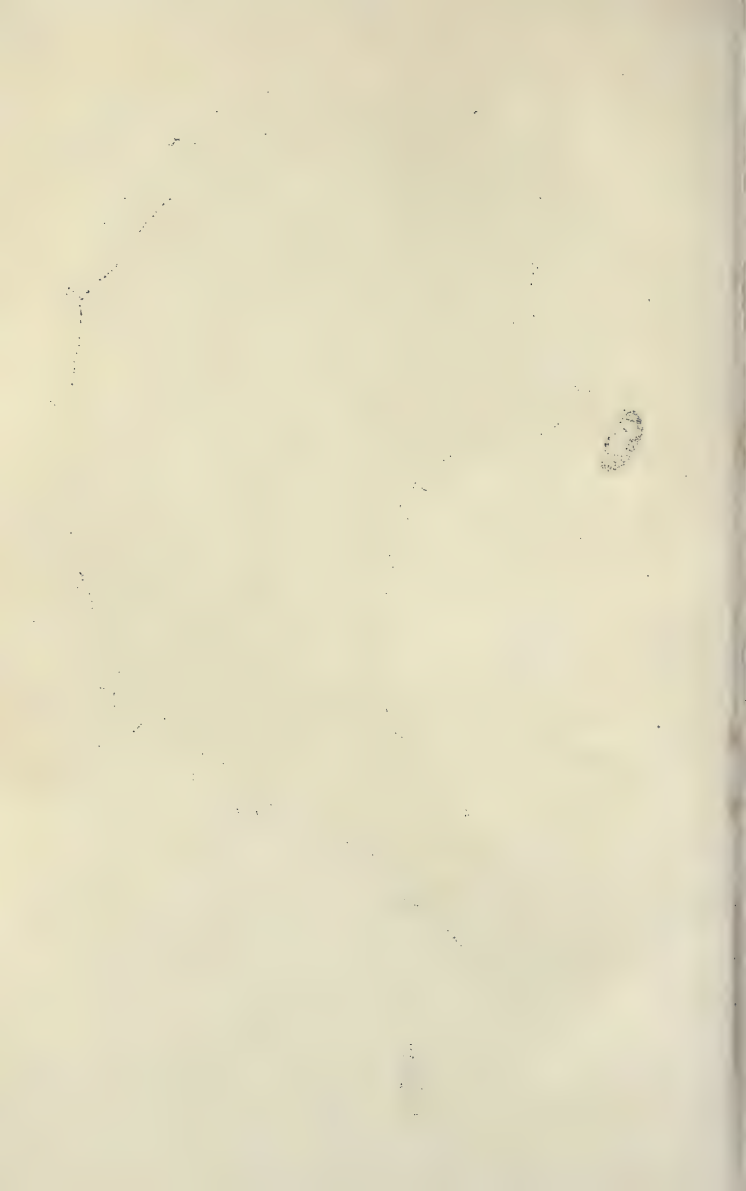
1. **Evacuate the stomach if poison was taken only a short time before**; syphon out the stomach with a stomach-tube, using plenty of water. If a stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically (1/10 grain, repeated every 15 minutes until effective). After giving emetic, always give plenty of luke-warm water to encourage vomiting.

2. **Give Spirit of Nitrous Ether** (1 to 2 teaspoonfuls in water every $\frac{1}{2}$ to 2 hours) and **Magnesium Sulphate—Epsom Salt**—(2 tablespoonfuls in a cup-



APPEARANCE
OF STOMACH
IN POISONING BY
SULPHURIC
ACID
(BRUNDAGE)

See pages 73, 303



ful of water). Give Sodium Bicarbonate (a teaspoonful in a gobletful of water).

3. Stimulate heart, circulation, and respiration with Brandy or Whisky (2 teaspoonful doses every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful hypodermically as frequently). Strychnine Sulphate ($\frac{1}{60}$ grain hypodermically, repeated in 10 to 30 minutes if necessary). Draughts of hot strong coffee or Caffein Citrate (2 or 3 grain doses) are also good.

SULPHURIC ACID.

(See Acids Mineral).

TANSY (TANACETUM VULGARE).

HISTORY:

Fatal dose: As a rule $\frac{1}{2}$ ounce of the oil causes death; 1 drachm of it has caused death. The dose of the oil is 1 minim.

Death by paralysis of heart.

SYMPTOMS:

Characteristic tansy odor of breath; convulsions; unconsciousness; dilated pupils; hurried, stertorous breathing; full, gradually weakening pulse.

TREATMENT:

Treat same as in poisoning by Savine.

TARANTULA.

(See Insects).

TARTAR EMETIC.

(See Antimony).

TIN COMPOUNDS.

SYMPTOMS:

Metallic taste in mouth; vomiting; diarrhœa; pain; diminished heart action.

TREATMENT:

1. **Evacuate the stomach**; syphon out the stomach with a stomach-tube, using plenty of water. If a stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($\frac{1}{10}$ grain, repeated every 15 minutes until effective). After giving emetic, always give plenty of luke-warm water to encourage vomiting.

2. **Give milk or white of egg freely.** Ammonium Carbonate (in 5 grain doses in a small cupful of water), also Sodium Bicarbonate, have been highly recommended for poisoning by the Chloride.

Magnesia mixed in water should be freely given and followed by mucilaginous and albuminous drinks, such as flaxseed tea, elm bark water, gruel, gum arabic or gum tragacanth water, or white of egg in water.

3. **Give Opium for pain** (Powdered Opium, 1 to 2 grains every $\frac{1}{2}$ to 2 hours), or Laudanum (20 drops every $\frac{1}{2}$ to 2 hours by mouth, or $\frac{1}{2}$ teaspoonful in gruel by rectum as frequently), or Morphine Sulphate ($\frac{1}{4}$ grain by mouth or hypoderm. every $\frac{1}{2}$ to 2 hrs.) to relieve pain and nervous irritability.

4. **Stimulate as in Antimony.**

TOBACCO—NICOTINE.**HISTORY:**

Pure Nicotine is a colorless oily liquid, and is rapidly fatal. Havana tobacco contains 2%. Kentucky, Tennessee and Virginia tobaccos, 6% or 7%. Poisoning has resulted from mistaking infusion for coffee; from tobacco chewing and smoking; from giving for worms, or to induce abortion; from children using old tobacco

pipes to blow soap bubbles; from local applications of tobacco, etc. Boys have died as result of smoking tobacco. Fatal dose Nicotine, Miii-60 in $\frac{1}{4}$, 2 or 3 hrs.

Death by paralysis of respiration or of heart.

SYMPTOMS:

Severe depression; giddiness; feeling of wretchedness and weakness; nausea; vomiting; weak, rapid pulse; cold, clammy skin; pupils at first contracted, then dilated; dyspnœa; muscular tremblings; there may be convulsions.

TREATMENT:

Put patient in a horizontal position.

1. If free vomiting does not occur, evacuate the stomach; syphon out the stomach with a stomach-tube, using plenty of water. If the stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($\frac{1}{10}$ grain, repeated every 15 minutes until effective). After giving emetic, always give plenty of water to encourage vomiting. Before beginning or completing syphonage, or before vomiting occurs or ceases, give Tannic Acid or Gallic Acid (30 grains in a small wineglassful of water), or in lieu may give Iodine (1 to 2 grains) and Potassium Iodide (5 to 10 grains) in water (1 to 2 tablespoonfuls), or in absence of these, copious draughts of strong tea or a decoction of oak bark ($\frac{1}{2}$ ounce to a small cupful of water).

2. Give Spirit of Nitrous Ether (1 to 2 teaspoonfuls in much water).

3. Give Strychnine Sulphate as the true physiological antidote ($\frac{1}{60}$ to $\frac{1}{20}$ grain hypodermically

every $\frac{1}{2}$ to 2 hours), or Tincture of Nux Vomica (30 minims in 2 tablespoonfuls of water by mouth), as an antagonist. Also stimulate with Brandy or Whisky (2 teaspoonful doses every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful doses hypodermically as frequently), or give Chloroform (20 to 30 drops in water every $\frac{1}{4}$ to 2 hours). **Apply cold to the head.**

4. **Employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body), to maintain bodily temperature.

TRIONAL.

(See Sulfonal).

TRUFFLES.

(See Fungi).

TURPENTINE—OIL OF TURPENTINE— (SPIRIT OF TURPENTINE).

HISTORY:

Usually given by mistake, or overdose when used to expel worms. A child died in 15 hours from $\frac{1}{2}$ ounce of the oil; a teaspoonful killed a 5 months old infant; recovery in child under 2 years old after taking a tablespoonful. Death of adult from 6 ozs.

Death by paralysis of respiration.

SYMPTOMS:

A Turpentine odor in the breath. Usually there is giddiness and a kind of intoxication, followed by gastro-enteritis; there is strangury, bloody, scanty urine, with odor of violets; there may be purging; cyanosis; dilated pupils; stertorous breathing; dry, moist skin; feeble, rapid pulse; coma; collapse.

Somewhat resembles poisoning by Opium.

TREATMENT:

I. **Evacuate the stomach if seen promptly;** syphon out the stomach thoroughly with a stomach-

tube, using plenty of water. May give emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically (1/10 grain, repeated every 15 minutes until effective). After giving emetic, always give plenty of luke-warm water to encourage vomiting. Give Magnesium Sulphate—Epsom Salt—(1 to 4 tablespoonfuls in a cupful of water) during syphoning or before emetic effect is over.

2. If bowels have not moved freely, give enema, also Magnesium Sulphate (1 to 2 tablespoonfuls in water). Apply hot fomentations to loins.

3. Give much water and demulcents (such as white of egg, milk, oil, gum arabic, flaxseed or elm tea, barley or starch water, oatmeal gruel, gelatine, flour and water, or even crushed bananas).

4. Give stimulants; as in Savine (q. v.).

5. Give Opium (Powdered Opium, 1 to 2 grains every 1/2 to 2 hours), or Laudanum (20 drops every 1/2 to 2 hours by mouth, or 1/2 teaspoonful in gruel by rectum as frequently), or Morphine Sulphate (1/4 grain by mouth or hypodermically every 1/2 to 2 hours), to relieve pain and nervous irritability.

TYROTOXICON.

(See Fish Poison and Ptomaines).

URETHAN.

HISTORY:

Death by asphyxia.

SYMPTOMS:

Vomiting; reduced temperature and heart action; muscular weakness; general anesthesia.

TREATMENT:

1. **Evacuate the stomach**; syphon out the stomach with a stomach-tube, using plenty of water. If a stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in two tablespoonfuls of water, repeated in 15 minutes if vomiting is not produced), or Cupric Sulphate (3 to 5 grains in 2 tablespoonfuls of water every 5 to 10 minutes until it acts), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($\frac{1}{10}$ grain, repeated every 15 minutes until effective). After giving emetic, always give plenty of luke-warm water to encourage vomiting.

2. **Stimulate heart, circulation, and respiration** with Brandy or Whisky (2 teaspoonful doses every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $\frac{1}{4}$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($\frac{1}{60}$ to $\frac{1}{20}$ grain hypodermically every $\frac{1}{2}$ to 2 hours) and Atropine Sulphate ($\frac{1}{120}$ to $\frac{1}{60}$ grain hypodermically every $\frac{1}{2}$ to 2 hours), or Tincture of Belladonna (20 drops in water every $\frac{1}{2}$ to 2 hours). Tincture of Digitalis (30 drops by mouth, or half as much hypodermically, every $\frac{1}{2}$ to 2 hours), or Digitalin ($\frac{1}{100}$ grain hypodermically every $\frac{1}{4}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary), may be used for the same purposes. Draughts of strong coffee may also be given.

VASELIN OR PETROLATUM.

Vaselin or Petrolatum is sometimes taken or given to children for colds or various lung affections. Large doses of the latter may produce unfavorable symptoms.

SYMPTOMS:

If unfavorable symptoms occur, may be cramps in lower extremities; severe, persistent vomiting; collapse.

TREATMENT:

1. **Evacuate the stomach if vomiting is not free;** syphon out the stomach with a stomach-tube, using plenty of water. If a stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 15 minutes if vomiting is not produced), Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($1/10$ grain, repeated every 15 minutes until effective). After giving emetic, always give plenty of luke-warm water to encourage vomiting.

2. **Stimulate heart, circulation, and respiration** with Brandy or Whisky (2 teaspoonful doses every 10 to 15 minutes, or $1/4$ teaspoonful hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $1/4$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($1/60$ to $1/20$ grain hypodermically every $1/2$ to 2 hours), and Atropine Sulphate ($1/120$ grain hypodermically every $1/2$ to 2 hours), or Tincture of Belladonna (20 drops in water every $1/2$ to 2 hours). Tincture of Digitalis (30 drops by mouth, or half as much hypodermically, every $1/2$ to 2 hours), or Digitalin

(1/100 grain hypodermically every $\frac{1}{4}$ to 1 hour), or Caffein Citrate (1 to 4 grains every $\frac{1}{4}$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $\frac{1}{4}$ to 1 hour if necessary), may be used for the same purposes. Draughts of strong coffee may also be given.

VERATRUM—VERATRUM ALBUM (WHITE VERATRUM, WHITE HELLEBORE)—VERATRUM VIRIDE (GREEN HELLEBORE)—VERATRINE—SABADILLA.

HISTORY:

Usually taken by mistake. Veratrine sometimes used to commit murder. 1/16 grain Veratrine has caused dangerous symptoms. Death in 5 hrs. to several days.

Death by paralysis of respiratory centres.

SYMPTOMS:

Burning and pain in alimentary canal; pronounced muscular relaxation; inability to swallow; nausea; vomiting; diarrhœa; palpitation of heart; pulse slow, thready; respiration labored; pupils usually dilated; may be convulsions.

TREATMENT:

Keep patient in horizontal position, with head lowest, and provide plenty of fresh air.

I. Evacuate the stomach unless vomiting has been free, from action of drug itself; syphon out the stomach with a stomach-tube, using plenty of water. If a stomach-tube is not at hand, use an emetic, such as Zinc Sulphate (20 grains in 2 tablespoonfuls of water, repeated in 15 minutes if vomiting is not produced), or Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or Syrup of Ipecac, a teaspoon-

ful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($1/10$ grain, repeated every 15 minutes until effective). After giving emetic, always give plenty of luke-warm water to encourage vomiting. Give in syphoning fluid or before vomiting ensues, **Tannic Acid** (30 grains in 2 tablespoonfuls of water), or Iodine (1 to 2 grains) and Potassium Iodide (5 to 10 grains) in water (2 tablespoonfuls), or give plenty of strong tea, or a decoction of oak bark ($1/2$ ounce to a small cupful of water).

2. **Stimulate** with hypodermic injections of Sulphuric Ether (10 to 15 minims), or with Brandy or Whisky (2 teaspoonful doses every 10 to 15 minutes, or $1/4$ teaspoonful doses hypodermically as frequently), or with Aromatic Spirit of Ammonia (a teaspoonful in a little water every 10 to 15 minutes, or $1/4$ teaspoonful hypodermically as frequently); also with Strychnine Sulphate ($1/60$ to $1/20$ grain hypodermically every $1/2$ to 2 hours), and Atropine Sulphate ($1/120$ grain hypodermically every $1/2$ to 2 hours), or Tincture of Belladonna (20 drops in water every $1/2$ to 2 hours). Tincture of Digitalis (30 drops by mouth, or half as much hypodermically, every $1/2$ to 2 hours), or Digitalin ($1/100$ grain hypodermically every $1/4$ to 1 hour), or Caffein Citrate (1 to 4 grains every $1/4$ to 1 hour), and inhalations of Amyl Nitrite (a 3 or 5 minim pearl crushed in a handkerchief and inhaled, using one every $1/4$ to 1 hour if necessary), may be used for the same purposes. Draughts of strong coffee may also be given by mouth or rectum.

3. **Employ artificial heat** (such as hot water bottles, or ordinary bottles containing hot water, or bags of salt, bricks, plates, or stove-lids, heated, applied to the feet and sides of the body), to maintain bodily temperature.

4. **Give Opium** (Powdered Opium, 1 to 2 grains every $1/2$ to 2 hours), or Laudanum (20 drops every $1/2$ to 2 hours, or $1/4$ teaspoonful in gruel by rectum

as frequently), or Morphine Sulphate ($\frac{1}{4}$ grain by mouth or hypodermically every $\frac{1}{2}$ to 2 hours), to relieve pain and nervous irritability.

5. **Apply electricity** over the heart, and resort to artificial respiration if death is threatened from embarrassed respiration (rhythmically raising and lowering arms from straight at sides to up over head and back again, 18 times a minute).

VERDIGRIS.

(See Copper).

VERMIN KILLERS.

(See Arsenic, Phosphorus, Strychnine).

WOORARA.

(See Curare).

WHITE PRECIPITATE.

(See Mercury Compounds).

WOUNDS, POISONOUS (POST MORTEM, DISSECTING, ETC.).

SYMPTOMS:

Pain; swelling; inflammation.

TREATMENT:

Wash under stream of water, suck out the poison, cauterize and apply antiseptic solution. May paint over and around wound with Tincture of Iodine. Dress antiseptically with Boric Acid, Carbolic Acid or Bichloride of Mercury solution.

ZINC COMPOUNDS: ZINC CHLORIDE— ZINC SULPHATE (WHITE VITRIOL), ETC.

HISTORY:

The Chloride used in embalming, as disinfectant and by tinsmiths, is corrosive, and the commonest cause of dangerous symptoms.

Fatal dose: 6 grains of Chloride; $\frac{1}{2}$ to 1 oz. of Sulphate. Fatal results from the Chloride in 4 hours. Infrequency of fatal result from Zinc Sulphate is

due to its usually being expelled by vomiting. Death in 4 hrs. to 4 months.

SYMPTOMS:

Corrosion of lips and mouth; pain or burning in throat, stomach and bowels; nausea; incessant vomiting and vomit blood stained; pulse and respiration increased; dyspnœa; pupils dilated; convulsions; paralysis; coma; death.

TREATMENT:

Antidotes: Albumin, soap, alkaline carbonates, and mucilage.

1. **Evacuate the stomach**, if free vomiting has not already occurred: syphon out the stomach with a stomach-tube, using plenty of water. If a stomach-tube is not at hand, use an emetic, such as Mustard (a tablespoonful in a small cupful of water, repeated in 15 minutes if not effective), or Ipecacuanha (Powdered Ipecacuanha, 30 grains; or syrup of Ipecac, a teaspoonful every 10 to 15 minutes until vomiting results), or Apomorphine Hydrochlorate, hypodermically ($\frac{1}{10}$ grain, repeated every 15 minutes until effective. Use stomach-pump if necessary. After giving emetic, always give plenty of lukewarm water to encourage vomiting.

N. B.—Put Sodium or Potassium Carbonate or Bicarbonate ($\frac{1}{2}$ ounce) in water used in syphoning to form the insoluble Zinc Carbonate, or give it in water after emetic to assist emetic action, etc.

2. **Give freely white of egg in water or milk.** Give Tannic Acid or Gallic Acid (30 grains in 2 tablespoonfuls of water), or give strong tea, or a decoction of oak bark ($\frac{1}{2}$ oz. to a cupful of water).

3. **Apply linseed meal poultices to the abdomen**, and if much pain, give an enema of starch or gruel and water. Give mucilaginous drinks, such as gum arabic or gum tragacanth water or flaxseed tea.

4. **Give Opium** (As directed under Veratrum).

KEY TO PRINCIPAL POISONOUS PLANTS, ETC.

- A.**—Aconite (*Aconitum Napellus*) Monkshood; Wolfsbane. 1. Stem (flowering).
2. Pistil. 3. Stamens. 4. The two recurved nectaries.
B.—Belladonna (*Atropa Belladonna*) Deadly Nightshade; Death's Herb; Poison Black Cherry. 1. Stamens. 2. Style. 3. Stigma. 4. Berry and seeds. 5. Berry. 6. Stem.
C.—Hyoscyamus (*Hyoscyamus Niger*); Henbane; Poison Tobacco; Insane Root. 1. Flowering stem. 2. Corolla.
D.—Stramonium (*Datura Stramonium*) Thorn, Devil's, or Mad Apple; Jamestown Weed. 1. Fruit shown in section. 2. Stem.
E.—Sanguinaria (*Sanguinaria Canadensis*) Bloodroot; Indian Red Paint. Puccoon.
F.—Physostigma (*Physostigma Venenosum*); Calabar Bean; Ordeal Bean. 1. A flowering branch. 2. Pistil (half of calyx removed). 3. Terminal part of style and appendage. 4. Appendage (trans. sec.). 5. A pod. 6, 7. Seeds. 8. Dry seed (trans. sec.). 9. Base of cotyledon, showing plumule and radicle.
G.—Cannabis (*Cannabis Sativa*); Hemp; *Var.* American Hemp (*Cannabis*); Indian Hemp (*Cannabis*). 1. Pistillate inflorescence. 2. Staminate. 3. Flower.
H.—Castor Oil Plant (*Ricinus Communis*); Palma Christi. 1. Stamens. 2. Anther. 3. Stigmas. 4. Capsule (transverse section). 5. Seed. 6. Embryo.
I.—Cherry Laurel (*Prunus Laurocerasus*). Branch, fruit and flowers.
J.—Coca (*Erythroxylon Coca*). Flowering branch.
K.—Colchicum (*Colchicum Autumnale*); Meadow Saffron. 1. Capsule (closed).
2. Capsule (open). 3. Styles. 4. Capsule (transverse section). 5. Seed.
L.—Conium (*Conium Maculatum*); Hemlock; Poison Hemlock; Deaver Poison; Water Parsley; Cicuta. 1. Fruit (vertical section). 2. Fruit (transverse section).
3. Fruit. 4. Flower. 5. Stem (flowering).
M.—Digitalis (*Digitalis Purpurea*); Purple or American Foxglove; Lion's Mouth; Fairy Fingers; Dead Men's Bells.
N.—Gelsemium (*Gelsemium Sempervirens*); Yellow Jasmine; Woodbine; Evening Trumpet Flower. 1. Branch (flowering). 2. Calyx and Pistil. 3. Corolla and Stamens. 4. Fruit. 5. Branch (fruiting).
O.—Lobelia (*Lobelia Inflata*); Wild or Indian Tobacco; Emetic Weed; Asthma Weed. 1. Branch (flowering). 2. Flower. 3. Capsule.
P.—Common Mushroom (*Agaricus Campester*); Edible Mushroom; Meadow Mushroom. 1. Three young plants. In one, veil just separated from margin. 2 and 3. Caps partly expanded, gills still pink (later black). 4. Mature plant, cap fully expanded, gills blackish brown. 5. Vertical section of cap and upper part of stem of immature plant. 6. Same, of mature plant. 7. Four spores $\times 200+$. Fig. 8. Variety: *Hortensis*—immature plant. 9. Mature. 10. Four spores $\times 200+$.
Q.—Poison Amanita, Death Cup (1 to 4. *Amanita Phalloides*). 1. Plant with whitish cap partly expanded. 2. Fully expanded. 3. Mature plant (vert. sec.). (5 to 7. *Amanita Verna*.) Vernal Amanita. 4. Young plant just emerging from wrapper. 5. Immature plant with cap partly expanded. 6. Same, fully expanded. 7. Four spores $\times 200+$; (poisonous).
R.—Fly Amanita (*Amanita Muscaria*); Fly Mushroom; (poisonous). 1. Young plant just breaking from its wrapper. 2. Plant with red cap partly expanded. 3. Mature plant, cap fully expanded and faded to yellow on striated margin. 4. Vertical section of part of cap and upper part of stem. 5. Four spores $\times 200+$.
S.—Nux Vomica (*Strychnos Nux Vomica*); Vomit or Poison Nut; Dog Poison; Ratsbane; Ordeal Root. 1. Branch (flowering). 2. Corolla (opened). 3. Calyx and Pistil. 4 and 5. Ovary. 6. Fruit. 7. Fruit (cross section). 8–10. Seed.
T.—Poke (*Phytolacca Decandra*); Poke Weed, etc. 1. Branch. 2. Fruit (single showing carpels).
U.—Poppy, Opium Poppy (*Papaver Somniferum*); Thebaica. 1. Ovary (with some stamens remaining). 2. Ripe Capsule. 3–4. Seeds. 5. Branch. 6. Capsule open.
V.—Rhus { *Rhus Radicans*, { Poison Ivy; Poison Oak.—(*Rhus Ver-*
Var. *Rhus Toxicodendron* { nix, Poison Sumach.)
W.—Tobacco (*Nicotiana Tabacum*). 1. Plant in flower. 2. Capsule. 3. Ripe capsule opening at top. 4. Capsule (transverse section).
X.—Veratrum Viride (*Veratrum Viride*); American Hellebore; Devil's Bite; Indian Poke; Itch Weed; Bugbane. 1. Root. 2. Flower.
Y.—Spigelia (*Spigelia Marilandica*); Pink Root. 1. Flowering stem. 2. Corolla (opened). 3. Ovary with part of style. 4. Fruit and calyx. 5. Same (one cell opened). 6. Ovary (trans. sec.). 7. Root stock and stem.
Z.—Strophanthus (*Strophanthus Hispidus*). Illustration: seed with comose awn.

PRINCIPAL POISONOUS PLANTS, ETC.

Referred to in foregoing. (See page 224.)
(Unaccompanied by names, as identification test).







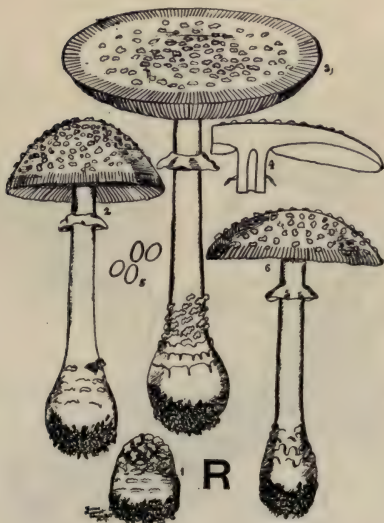
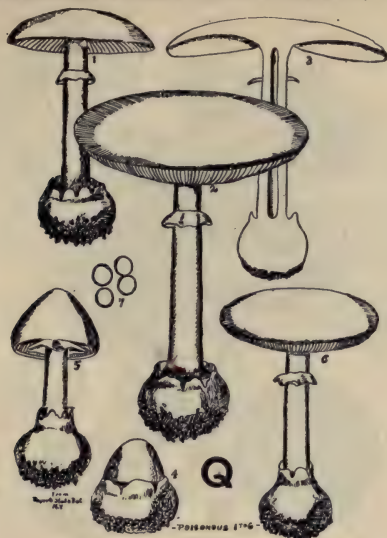








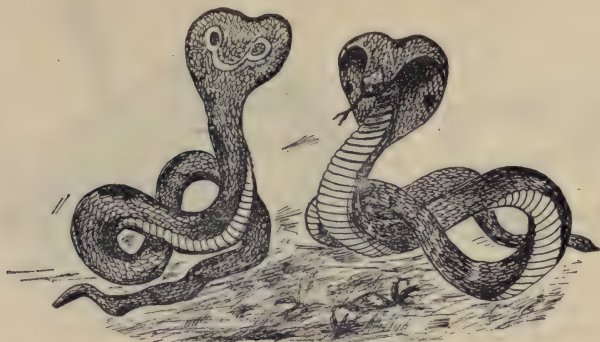








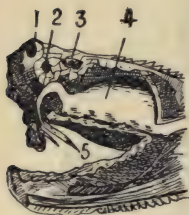




COBRA DE CAPELLO



FER DE-LANCE



HEAD OF

RATTLESNAKE

(1 Nostril 2 Pit 3 Eyes 4 Poison gland 5 Fang)



RATTLESNAKE



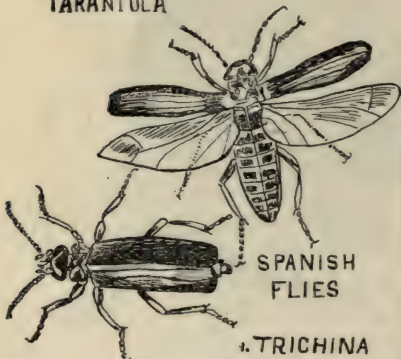
TARANTULA



RATTLE OF
RATTLESNAKE
(SNAKE 14 YRS OLD)



SCORPION



SPANISH
FLIES

1. TRICHINA
2. TRICHINA, ENCYSTED



KEY TO TREATMENT.

(A digest arranged from the preceding pages of Part II.)

POISON.	TREATMENT.	
	Chemical and Mechanical.	Physiological.
ACETANILID. ANILIN. ANTIPYRINE. EXALGIN. PHENACETIN.	Evacuate the stomach.	Recumbent position. Artificial respiration. Caffeine Citrate. Digitalis. Strychnine. Oxygen. Heat.
ACID— ACETIC. — <i>Mineral Acids</i> — HYDROCHLORIC. PHOSPHORIC. NITRIC. SULPHURIC.	Magnesia. Albumin. Lime-Water. Soap, Demulcents. Avoid emetics and stomach pump if acid concentrated.	Stimulants. Opium. External heat.
ACID— CARBOLIC. CREOSOTE. GUAIACOL.	Alcohol. Evacuate stomach. Sodium or Magnesium Sulphate. Lime-Water or Syrup of Lime. Soap. Albumin. Demulcents. (Avoid Oil and Glycerine)	Atropine. Opium. Stimulants. External heat. Artificial respiration.
ACID— CARBONIC.		Fresh air. Friction, and heat to extremities. Artificial respiration.
ACID— HYDROCYANIC (also the CYANIDES).	A mixture of Ferrous and Ferric Sulphates with Sodium or Potassium Hydroxide or Carbonate or Magnesia. Evacuate stomach if time. Pot. Permanganate or Hydrogen Peroxide. Demulcents if required.	Cold douches. Ammonia or Chloride of Lime inhalations. Artificial respiration. Stimulants. Artificial heat.
ACID— OXALIC.	Lime in any form. Magnesia. Demulcents.	Stimulants. Opium. External heat.
ACONITE.	Tannic Acid (10-30 grs.) or Animal Charcoal (1 tablespoonful). Syphon out stomach. (Avoid emetics.)	Horizontal position. Artificial respiration. Digitalis. Artificial heat. Stimulants.

N. B.—By STIMULANTS is meant not only Alcohol, but also the various cardiac and respiratory stimulants, such as Ammonia, Digitalis, Caffeine, Strychnine, Nitroglycerine, Atropine, etc.

POISON.	TREATMENT.	
	Chemical and Mechanical.	Physiological.
ALCOHOL, ETHYL.	Evacuate stomach.	Cold to head; heat to extremities. Ammonia inhalations. Ammonium Chloride. Atropine. Digitalis. Electricity. Artificial respiration.
ALCOHOL, METHYL.	Evacuate stomach.	Pilocarpine Hydrochlorate. Treat as for Ethyl Alcohol.
ALKALIES— AMMONIA, CAUSTIC POTASH, CAUSTIC SODA, LIME, etc.	Dilute Acids, especially Vegetable Acids, as Citric or Tartaric, Lemon, Orange juice, Vinegar. Milk, Oil.	Stimulants. Artificial heat. Opium. For Ammonia; Aconite, Digitalis, cold air.
ALKALOIDS.	Tannic Acid. Charcoal. Iodine. Albumin. Evacuate stomach.	Maintain circulation and respiration.
ANESTHETICS— CHLOROFORM, ETHER, NITROUS OXIDE.	WHEN SWALLOWED : Evacuate stomach if possible, and give water containing Sodium Carb. or Bicarb. Also demulcents if necessary.	Remove cause. Place head low. Artificial respiration. Fresh air, Oxygen. Atropine. Stimulants Artificial heat.
ANTIMONY and its COMPOUNDS.	If necessary evacuate stomach. Tannic Acid. Demulcents.	Stimulants. Opium. Artificial heat.
ARSENIC— ARSENOUS ACID. FOWLER'S SOLUTION, PARIS GREEN. "ROUGH ON RATS," etc.	Evacuate stomach. The Hydrated Oxide of Iron with Magnesia; or, the Hydrated Sesquioxide of Iron; or Dialyzed Iron. Demulcents. Castor Oil.	Stimulants. Opium if necessary. Artificial heat. Spt. Nitrous Ether
BARIUM and its COMPOUNDS.	Evacuate stomach. Magnesium or Sodium Sulphate. Demulcents.	Stimulants. Opium if necessary. Artificial heat.
BELLADONNA. HYOSCYAMUS. STRAMONIUM.	Tannic Acid. Evacuate stomach.	Opium. Pilocarpine Nitrate. Muscarine. Artificial respiration. Alternate hot and cold douches. External heat. Stimulants.
CANNABIS— AMERICAN or INDIAN HEMP.	Tannic Acid. Evacuate stomach.	Stimulants. External heat.

POISON.	TREATMENT.	
	Chemical and Mechanical.	Physiological.
CHLORAL.	Evacuate stomach. (Is well to siphon out stomach with tea or coffee.) Liquor Potassæ (3 ½-2 in water ¾ viii.)	Artificial respiration. Cold to head. Ammonia and Oxygen inhalations. External heat. Picrotoxin. Strychnine. Atropine. Stimulants
COCAINE.	If swallowed: Give Tannic Acid and evacuate stomach if possible.	Horizontal position. Fresh air. Amyl Nitrite. Morphine. Atropine. Artif. resp. Stimulants. Oxygen. Heat. Electricity.
CONIUM.	Tannic Acid. Evacuate stomach. Demulcents.	Place head low. Stimulants. Artificial heat. Artificial respiration if necessary.
COPPER and its COMPOUNDS.	Potassium Ferrocyanide. Albumin or milk. Evacuate stomach. Demulcents.	Artificial heat. Stimulants. Opium.
CROTON OIL.	Evacuate stomach. Demulcents.	Artificial heat. Opium. Stimulants.
DIGITALIS.	Tannic Acid. Evacuate stomach. Magnesium Sulphate.	Horizontal position. Aconite. Saponin. Alcoholic stimulants. Artificial respiration. Heat.
FOOD, POISONOUS.	Tannic Acid. Evacuate stomach. Castor Oil. Antiseptics if required.	Stimulants. Atropine for poisoning by Muscarine. Artificial heat.
GASEOUS POISONS.		Fresh air. Oxygen. Artificial respiration. Rest. Stimulants.
GELSEMIUM.	Tannic Acid. Evacuate stomach. Castor Oil.	Morphine. Atropine. Stimulants. Artificial respiration. Hot and cold douches alternated. Artificial heat. Electricity.
IODINE and its COMPOUNDS.	Starch or flour with water. Evacuate stomach. Demulcents.	Stimulants. Artificial heat. Morphine.
LEAD and its COMPOUNDS.	Magnesium or Sodium Sulphate. Alum. Evacuate stomach. Demulcents.	Stimulants. Opium if necessary. Artificial heat.
LOBELIA.	Tannic Acid. Evacuate stomach. Castor Oil.	Stimulants. Artificial heat. Opium.

POISON.	TREATMENT.	
	Chemical and Mechanical.	Physiological.
MERCURY and its COMPOUNDS.	Albumin (White of one Egg to 4 grs. Corrosive Sublimate). Evacuate stomach if vomiting has not occurred; also after Albumin.	Stimulants. Artificial heat. Opium.
NITROGLYCERINE.	Emetics and Cathartics.	Horizontal position. Cold to head. Atropine. Ergot. Strychnine.
NUX VOMICA—, STRYCHNINE, BRUCINE, etc.	Charcoal, Tannic Acid, or Potassium Permanganate. Evacuate stomach quickly before convulsions. Tube, or Apomorphine hypodermic.	Horizontal position in dark, quiet room. Artificial respiration. Chloroform for convulsions. Bromides. Chloral. Opium. Urethane.
OPIUM— LAUDANUM. PAREGORIC. MORPHINE. CODEINE. HEROINE, etc.	Potassium Permanganate, or Tannic Acid. Evacuate stomach.	Keep patient awake by flagellation, walking, electricity, etc. Amyl Nitrite. Atropine. Strychnine. Digitalin. Coffee, Tinc. of Capsicum, orange or lemon juice. External heat. Artific. respiration.
PHOSPHORUS.	Copper Sulph. Old Oil of Turpentine, Pot. Permang. or Hydrog. Perox. early. Evacuate stomach. Magnesium Sulphate. (No fats or oils.)	Opium. Oxygen inhalations. Artificial heat.
RHUS (POISON IVY, POISON OAK, POISON SUMACH).	Apply: Grindelia Rob. Alum. Alc. Sol. of Lead Acetate. (Avoid oils and fats.) Give Mag. Sulph.	Opium to quiet.
SILVER COMPOUNDS.	Sodium Chloride. Evacuate stomach. Demulcents of albumin, milk, etc.	Opium. Stimulants if necessary.
STROPHANTHUS.	Tannic Acid. Evacuate stomach. Saline cathartic.	Chloroform or Ether inhalations, Chloral or Bromide. Artif. respiration.
SULFONAL. TRIONAL.	Evacuate stomach. Magnesium Sulphate.	Stimulants.
TOBACCO.	Tannic Acid. Evacuate stomach.	Horizontal position. Cold to head. Strychnine. Artificial heat.
VERATRUM.	Tannic Acid. Evacuate stomach.	Horizontal position. Fresh air. Stimulants. Artif. heat. Opium. Electricity.
ZINC COMPOUNDS.	Tannic Acid. Evacuate stomach. Bicarb. Soda. Albumin. Lime-Water. Soap. Mucilage. Milk.	Morphine. Hot fomentations.

PART III.

THE INDICATIONS OF VARIOUS SYMPTOMS.

(AN AID TO DIAGNOSIS IN POISONING).

BLINDNESS.

Suspect: Wood Alcohol, Barium, Digitalis, Quinine, Nicotine, etc.

BREATH (Specific Odor of Breath).

Suspect: Acid Hydrocyanic, Alcohol, all ethereal oils, Ammonia, Amyl Nitrite, Amylene-hydrate, Bromine, Bromoform, Chloroform, Creosote, Ether, Brominated Ether, Iodine, Iodoform, Nitro-benzene, Opium, Paraldehyde, Pental, Phosphorus, salts of Tellurium, Camphor.

BREATH (Phosphorescence of Breath).

Suspect: Phosphorus.

COLLAPSE.

Suspect: Concentrated corrosive acids or alkalis, Antimonial preparations, Arsenic, Colchicine, Aconite, Nicotine.

COLOR (Objects Appear Yellow or Green).

Suspect: Santonin.

COMA, PROFOUND.

Suspect: Alcohol, Aniline Oil, Belladonna, Carbon Monoxide, Chloral and its analogues, Chloroform and its analogues, Coal Gas, Opium or Morphine, Oxybutyric Acid, Sulfonal, Trional.

CONVULSIONS, SEVERE; OR TETANUS.

Suspect: Aconitin, Ammonia salts, Cocaine, Condurangin, Corydalin, Cicutoxin, Cornutin, Cytisin, Digitaliresin, Filicic Acid, Gelsemine, Guandin, Picrotoxin, Ptomaines, Strychnine, Tetanus bacillus toxin, Thebaine, Antimony, Arsenic, etc.

COUGH, BARKING, AND APHONIA.

Suspect: Allantotoxin, Atropine, Hyoscyamine, Scopolamin, etc.

CYANOSIS.

Suspect: Anilin, Acetanilid, Benzocoll, Exalgin, Nitrobenzene, Phenacetin, Toluidin.

DEAFNESS AND BLINDNESS (More or Less Complete).

Suspect: Aconite, Belladonna, Cocaine, Conium.

DEATH, QUICK AND SUDDEN.

Suspect: Acid Hydrocyanic, Acid Carbolic, Carbon Dioxide, Creosote, Potassium Cyanide or other cyanides. Strong Ammonia, Oxalic Acid.

DELAYED SYMPTOMS.

(First symptoms of poisoning 12 to 24 hours after eating).

Suspect: Arsenic (not in solution), Mushrooms containing Phallin, Virus of rabid animals.

DEPRESSION, MENTAL.

Suspect: Alcoholism, Cocaine habit, Morphine habit, Maydism, Mercurialism Ergotism, Etherism, Saturnism, Carbon Disulphide, Iodoform.

DIARRHŒA WITH VOMITING.

Suspect: Antimony and substances containing it, Arsenic and substances containing it, Colchicine,

Colocynths, corrosive poisons, Croton Oil, substances of the Digitalin group, Emetin, Muscarin, Nicotine, Pilocarpine, etc.

DISCOLORATION (Black and Blue Peripheral Parts of Body).

Suspect: Gangrenous Ergotism.

DISCOLORATION (Skin Dark and Muddy, but not Blue).

Suspect: Poisoning by Arsenic (Arsenical-mel-anosis), Copper, Lead, Mercury, Argyria.

DISCOLORATION (Discolored Tongue and Mucous Membrane of Mouth).

White: Carbolic Acid, corrosive acids, corrosive alkalis, corrosive metallic salts.

Brown: Bromine, Iodine.

Yellow: Nitric Acid, Picric Acid.

Reddish-Yellow: Salts of Chromic Acid and Bichromates.

Greenish-Blue: Paris Green, salts of Copper.

DISCOLORATION (Icteric, or Pseudo-Icteric, Yellowish-Brown Discoloration of the Conjunctiva or of the Skin).

Suspect: Amyl Nitrite, Arsine, Helvellaic Acid, Phosphorus, Phallin, Potassium Chlorate, Pyrogallol, Saponin substances, Sodium Nitrate, Solanin.

ERUPTION (Acne Pustules).

Suspect: Bromides, compounds of or substances which contain Antimony, arsenicals, Emetine.

ERUPTION (Clear Vesicles on Skin or in Mouth).

Suspect: Preparations of Cantharides, Crowfoot, etc.

ERUPTION (Eczematous).

Suspect: Anilin (externally), Carbolic Acid, Cardol, Cinchona (dust of the bark), Croton Oil, Curcas Oil, Sulphonal, Tar, Vanilla (poor quality).

ERUPTION (Nettle, Scarlatinal or Measles-like Rash).

Suspect: Antipyrine, Atropine, Belladonna, Balsam of Copaiba, Chloral, Cubebs, Hyoscyamine, Iodine, Morphine, Quinine, Antimony, Arsenic.

GUMS (Dark Line or Border on Gums).

Suspect: Bismuth, Copper (green), Lead (blue), Mercury (bluish), Silver.

HEARING, IMPAIRED OR LOST.

Suspect: Barium, Bromism, Cinchonism, Salicis.

ILLUSIONS, VISIONS, ETC.

Suspect: Absinthe, Opium and Morphine, Cocaine, etc.

MANIA OR DELIRIUM (Raving Mania, Raging Delirium, or Mental Excitation).

Suspect: Alcoholism (chronic), Atropine, Camphor, Cannabinon, Cocaine, Physostigmine, Veratrine, Hyoscyamus, Stramonium, Cannabis.

MISCARRIAGE OR ABORTION.

May be due to: Cotton Root Bark, Cornutin, Pennyroyal, Phosphorus, Rue, Savine, Tansy, etc.

ŒDEMA (of Glottis).

Suspect: All the corrosive poisons.

ŒDEMA (Pulmonary).

Suspect: Ammonia, Morphine, Muscarine, Pilocarpine.

PAIN.

Colic: Arsenic, Colocynth, Copper, Lead.

Cramp: Antimony, Arsenic, Lead.

PARALYSIS (As a rule, ascending).

Suspect: Aconite, Arsenic, Colchicine, Coniine, Curare, Ergotinic Acid, Gelsemium, Guachamacapoin, Lead.

PERSPIRATION (PROFUSE).

Suspect: Aconite, Acetanilid, Antipyrine, Exalgin, Phenacetin, Sulfonal, etc.

PRIAPISM.

Suspect: Cantharidin, etc.

PULSE (Greatly Accelerated).

Suspect: Atropine, Hyoscyamine, Scopolamine, etc.

PULSE (Particularly Slow).

Suspect: All narcotics, Baryta, Lead, Morphine, Muscarine, Nicotine (later rapid and irregular), Opium, Physostigmine, Pilocarpine (later rapid and irregular), substances of the Digitalin group (later rapid pulse).

PULSE, WIRY.

Suspect: Baryta, Lead, substances of the Digitalin group.

PUPILS, CONTRACTED.

Suspect: Codeine, Morphine (Opium), Muscarine, Nicotine, Physostigmine, Pilocarpine.

PUPILS, DILATED.

Suspect: Aconitine, Alcohol, Atropine, Chloroform (swallowed), Cocaine (subsequently contracted), Coniine, Cytisin, Eppedrin, Gelsemine, Homatropine, Hyoscyamine, Opium (last stage), Scopolamin (Hyoscin), Stramonium.

SALIVATION.

Suspect: Ammonia, Antimony, Arsenic, Cantharidin, Cytisin, Mercury, Muscarine, Nicotine, Physostigmine, Pilocarpine, Saponin substances, etc.

SKIN, MOUTH AND PHARYNX, VERY DRY.

Suspect: Atropine, certain parts of Belladonna, Hyoscyamus, Thorn, Apple, Allantotoxin (from decaying fish), Hyoscin, Hyoscyamine, Scopolamin.

SKIN, MOIST.

Suspect: Aconitine, Antimony, Lobelin, Morphine, Muscarine, Nicotine, Opium, Physostigmine, Pilocarpine, Alcohol.

SKIN, YELLOW.

Suspect: Picric Acid and its salts.

TASTE, FOUL.

Suspect: Arsenic, Copper, Lead, Mercury, Potassium Iodide, Tartar Emetic.

TEMPERATURE, MARKED ELEVATION OF.

Suspect: Cocaine, enzymes, Phosphorus, strong convulsants (under certain conditions).

TINGLING OR NUMBNESS IN LIPS OR TONGUE.

Suspect: Aconite.

URINE (Having Coloring Matter of Blood in Solution).

Suspect: Cyclamin, Solanin and other Saponin substances, Helvellaic Acid, Phallin.

URINE	{	Claret Colored: Sulfonal, Trional.
		Becoming Scarlet in Air: Santonin.
		Reddish Yellow: Picric Acid and Salts.
		Becoming Dark Green in Air: Phenol.

URINE, ACID (Containing Colorless Crystals).

Suspect: Oxalic Acid and its Salts.

URINE, ICTERIC.

Suspect: Cephalanthin, Phallin, Phosphorus, Tolulene, Diamin.

URINE (Containing Methæmoglobin With or Without Hæmatin).

Suspect: Amyl Nitrite, Arsine, all corrosive poisons, Chrysarobin, Potassium Chlorate, Pyrogallol, Sodium nitrite.

URINE (That Reduces Fehling's Solution).

Suspect: Benzaldehyde (Bitter Almond) Oil, Carbon Monoxide, Chloral, Chloroform, Formic Acid, Oxalic Acid and its salts, Phloridcin, Pyrogallol, Uranium salts.

URINE (Very Odorous).

Suspect: Ammonia, Asparagus, Tellurium, Turpentine Oil (violets), and other ethereal oils.

URINE (Unnatural Scantiness or Suppression).

Suspect: Cantharidin, Corrosive Sublimate and other mercurial preparations, Oxalic Acid, Oxaminic Acid, Oxamid, Potassium Oxalate.

VISION, DOUBLE.

Suspect: Belladonna, Conium, Gelsemium, Pto-maine-poisoning, etc.

VOICE (Loss of Voice).

In Barium, Lead paralysis, Trichinosis, etc.

VOMITING.

Aconite, Ammonia (stringy saliva, perhaps blood), Antimony (mucus, white, stringy, perhaps bloody), Arsenic (brown, with blood), Colchicum, Colocynth, Digitalis (grass-green vomit), Phosphorus (vomit luminous in dark).

VOMITING AND PURGING.

Suspect: Antimony and substances containing it, Arsenic and substances containing it, Colchicin, Colocynths, corrosive poisons, Croton Oil, substances of the Digitalin group, Emetin, Muscarine, Nicotine, Pilocarpine, etc.

VOMITING, WITHOUT DIARRHŒA.

Suspect: Apomorphine, Cytisin, Lobelin, Narcissus poison, etc.

Poisons Commonly Resorted to by Suicides :

Carbolic Acid, Oxalic Acid, Paris Green, Arsenic, rat paste, Chloral, Opium and its preparations, Prussic Acid, Strychnine, Sugar of Lead, illuminating gas, charcoal fumes, etc.

PART IV.

TABLE OF IDENTIFICATION TESTS FOR POISONS.

(AN ÉPITOME OF SOME OF THE PRINCIPAL TESTS)

ACID CARBOLIC (PHENOL).

Carbolic acid added either to albumin or collodion causes such to coagulate.

An aqueous solution of carbolic acid treated with one drop of ferric chloride solution gives a permanent violet blue color (the reaction may be interfered with by the presence in excess of hydrochloric or acetic acid or alcohol); the color produced by creosote with ferric chloride solution is at first violet blue, but changes rapidly to greenish and brown, with formation usually of a brown precipitate:

With bromine water, carbolic acid forms a white flocculent precipitate of tribrom-phenol. Under the microscope it appears as acicular crystals.

Carbolic acid mixed with ammonia water and a little chlorinated soda solution, and warmed, develops a blue color. To a few drops of carbolic acid solution on a white porcelain surface add three or four drops of a solution of one part of molybdic acid in ten or fifteen parts of concentrated sulphuric acid; a yellowish-brown coloration results, which is soon followed by a beautiful purple color.

When carbolic acid is in the urine, it is in combination with the sulphates, so that neither the sulphuric nor the phenol radical will respond to the usual tests; but the natural quantities of sulphates again appear if the urine be boiled with hydrochloric acid. The preceding tests may then be employed.

In making post-mortem investigations, the odor of

carbolic acid is, as a rule, observable upon opening the body. The stomach contents are to be acidified and distilled, and the various tests applied to the distillate.

ACID HYDROCHLORIC.

Hint.—All acids turn blue litmus red.

If a glass rod be dipped in ammonia water and then held over hydrochloric acid, dense white fumes are produced.

Hydrochloric acid, even in diluted solutions, treated with silver nitrate, gives a curdy white precipitate which is dissolved upon adding ammonia water, and reprecipitated by nitric acid.

ACID HYDROCYANIC.

A characteristic test is its odor: it has the odor of bitter almonds or peach kernels.

A glass rod moistened with silver nitrate becomes milky in the vapor of hydrocyanic acid.

By silver nitrate, the acid is precipitated as silver cyanide, a white, curdy precipitate, not soluble in cold or weak nitric acid, but entirely soluble in boiling concentrated nitric acid.

To the suspected liquid add a little solution of potash and then a mixture of ferrous and ferric sulphates; a dirty greenish-blue precipitate results, which, should hydrocyanic acid be present, becomes clear Prussian blue on acidifying with pure hydrochloric acid.

Liebig's test (characteristic in the absence of meconic acid):—

Treat a solution of hydrocyanic acid with ammonium sulphide, and gently heat; a white sulphocyanide of ammonium is produced; by touching this with a drop of persulphate or perchloride of iron, a blood-red sulphocyanate of iron results.

Make suspected fluid slightly alkaline with potash; add cupric sulphate solution and a greenish-white pre-

precipitate will be obtained; add a few drops of hydrochloric acid, and it turns white.

If, in post-mortem investigations, the jar in which the liver, brain, stomach and contents, and other organs, is received, is gently warmed, and a glass rod or watch glass moistened with silver nitrate solution held over its mouth, the vapor which rises from the contents of the jar will, if hydrocyanic acid is present, form white, crystalline silver cyanid, on the rod or watch glass. This may be proved to be silver cyanid and not silver chlorid by its turning blue, upon adding hydrochloric acid and a mixture of ferrous and ferric sulphate. Extended chemical analysis is carried out as indicated in Part V of this book.

As a rule, hydrocyanic acid may be found in the body for about three weeks after death. But in case of body decomposition the sulphuretted hydrogen generated may convert the acid into the thiocyanate. In such case the thiocyanate should be dissolved out by alcohol, and this followed by filtration and evaporation. The residue should then be dissolved in water and tested by a ferric salt. Thiocyanate has been found in the body as long a time after death as four months. The fact that thiocyanates are found in the saliva and the latter may have been mixed with the material under investigation, should not be overlooked.

ACID NITRIC.

Concentrated nitric acid is known by its orange colored, irritating fumes. Poured on copper filings it effervesces, gives off red acrid vapor and, a blue liquid remains.

Nitric acid mixed with hydrochloric acid dissolves gold. A trace of nitric acid with sulphuric acid gives a blood-red color with narcotine. The strong acid gives a deep red color with brucine.

Nitric acid stains all albuminoid substances yellow; gives a yellow stain on skin or piece of quill; reddens morphine and its salts; blackens green iron sulphate in the presence of sulphuric acid.

ACID OXALIC.

The crystals are oblique, flattened, octahedral prisms, colorless, odorless, permanent in the air, and very acid; thus distinguished from crystals of magnesium sulphate, and zinc sulphate. When the crystals are heated they melt, dissipate without charring and leave no residue.

Cupric sulphate added to solution of oxalic acid gives a light-blue precipitate of cupric oxalate not redissolved by a few drops of hydrochloric acid.

Adding lime water forms calcium oxalate, which is insoluble in excess of lime water but soluble in nitric acid or hydrochloric acid, but not in any vegetable acid.

To a solution of oxalic acid add silver nitrate and a white precipitate of oxalate of silver is produced, soluble in nitric acid; when dried and heated on platinum foil it detonates and evolves a white vapor.

In post-mortem analyses, acidify the material to be tested (kidneys, stomach and contents, etc.) with hydrochloric acid and digest the whole for several hours with dilute alcohol, stirring frequently. After filtration ammonium hydroxid should be added to the filtrate until the latter is alkaline; acetic acid should then be added until a slight excess results; then add calcium chlorid; after thorough stirring stand the mixture aside. If a precipitate results, it is from the combination of oxalic acid with calcium. Under the microscope the characteristic octahedral crystals may be identified. The salt turns gray upon being heated. Dissolve some of the precipitate in water, acidify with dilute sulphuric acid; upon adding a few drops of potassium permanganate solution, decolorization of the permanganate occurs.

ACID SULPHURIC.

The acid looks oily and is heavy. It feels soapy in the fingers. Concentrated sulphuric acid is usually white, or if impure, a brownish colored liquid, and chars wood or other organic matter.

Upon mixing it with water, heat is evolved. It forms sulphurous acid gas when boiled with mercury.

Add a small portion of veratrine to some of the diluted acid, carefully evaporate to dryness, and a crimson-purple color is obtained. Sulphuric acid gives a white precipitate with barium chloride.

ALKALIES (SOLUTIONS OF AMMONIA, POTASSA, SODA).

The alkalies turn red litmus blue.

They feel soapy in the fingers.

They are not precipitated by adding solution of potassium carbonate as the solution of alkaline earths are. They neutralize acids, and saponify fats.

The presence of one of the caustic alkalies, in vomited matters or stomach contents, may be suspected, when in addition to alkaline reaction and soapy feeling in the fingers, the suspected materials become frothy when shaken, and produce but slight effervescence upon adding an acid. Potash, or soda, would be indicated if, when the suspected materials are warmed, ammoniacal odor is absent, and the holding over them of a glass rod, dipped in hydrochloric acid, produces no cloudy effect upon the surface of the rod. If some of the suspected material be filtered, the filtrate evaporated to dryness, then heated to a dull red heat until all organic matter is destroyed, and then cooled, upon adding a small quantity of dilute hydrochloric acid a solution is obtained with which to determine whether the alkali is potash or soda. Upon testing this solution with a platinum wire held in the colorless flame of a Bunsen burner, a lavender color imparted to the flame indicates potassium, a yellow one sodium.

ALKALOIDS.

Wormley's test directs to treat the suspected substance, in solution, with an alcoholic solution of picric acid, and if alkaloids are present a yellow precipitate will be obtained.

Mayer's reagent gives a white precipitate with alkaloids.

Wagner's reagent gives with alkaloids a brown precipitate soluble in alcohol.

A powder of either brucine, delphine, morphine, impure strychnine, or physostigmine with nitric acid, gives a red color; if by adding stannic chloride it becomes violet, it is brucine; if it becomes black, it is delphine; if it is soluble, giving off free iodine when iodic acid is added, it is morphine; if not soluble and will not decompose iodic acid, it is strychnine; if the powder became green when nitric acid was added, it is solanine; if the powder is insoluble in ether and does not redden nitric acid, it is emetine; if it is soluble in ether, does not redden nitric acid, and is volatilized, it is atropine; if it is soluble in ether, does not redden nitric acid, and is not volatilized, it is veratrine.

ACONITINE, COCAINE, CONIINE, DATURINE, NICOTINE, ETC., AND GLUCOSIDE SOLANIN.

Aconitine.

Pure Aconitine crystals are colorless and transparent. If a solution of aconitine be applied to the skin it produces a sensation of heat and numbness. It is said that so small a quantity as one one-hundredth part of a grain, dissolved in spirit and rubbed into the skin, will cause a loss of feeling which will continue for quite a while. For toxicological analysis a modification of Stas' process is employed. (See text-books).

Stas' Method.—In this method the organic matters are extracted by strong alcohol, tartaric acid being added. Then the filtered solution is carefully neutralized with soda, shaken up with ether, and a pipette used to separate the ethereal solution. Some analysts have recommended that chloroform be used in place of the ether, and that amyl alcohol also be used; also that acetic, hydrochloric, and sulphuric be substituted for tartaric acid. Otto proposed a modification of Stas' method, and such modification

is considered by very many chemists to be a decided improvement over the original method of Stas. Dragendorff's method is quite frequently employed in the isolation and identification of alkaloids. (See books on organic analysis).

Cocaine.

In aqueous solution, cocaine is best identified by means of the crystalline precipitates which platinum chloride, gold chloride and picric acid produce. In very dilute solution iodine in potassium iodide produces a rose-colored precipitate; and a non-crystalline brown one in stronger solutions.

If a small portion of cocaine is covered with fuming nitric acid and dried on a water bath, then when cold, moistened with a drop of solution of potassium hydroxid in absolute alcohol, a distinct odor of citronella or peppermint may be observed.

Coniine.

The leaves of parsley may readily be mistaken for those of conium. In suspected poisoning by conium, the contents of stomach and intestines should be carefully examined for the remains of hemlock seeds or leaves. Suspicious leaves should be carefully rubbed up in a mortar with potassa to bring out the peculiarly mousy smell of conium leaves.

Employ Stas' process in analysis.

Coniine is found chiefly in the conium seeds, and is exceedingly powerful and fatal.

If a drop of coniine is put in a watch-glass, over which another watch glass be placed, on the under surface of which has been put a drop of pure hydrochloric acid, dense, white fumes will quickly fill the enclosed space, and the coniine be changed into a quantity of beautiful, delicate, crystalline needles. These do not deliquesce upon exposure to air.

Daturine.

Stramonium seeds are kidney shaped, wrinkled, black or brown in color, and larger than the seeds of

belladonna or hyoscyamus. Daturine may be detected in the stomach and other organs by the same analytical processes as employed for Atropine.

Nicotine.

Upon adding a solution of iodine in ether to an ethereal solution of nicotine, after some time long needle-like crystals form.

Platinum chloride causes a yellow precipitate to form which is soluble in hydrochloric acid, and appears crystalline under the microscope.

Picric acid produces a yellow, amorphous precipitate, which under the microscope appears as a crystalline tuft. For organic analysis Stas' process is advantageously employed.

The Glucoside Solanin.

In the pure state solanin appears as delicate, acicular crystals, soluble in ethyl and amyl alcohol, slightly soluble in ether, almost insoluble in water and altogether insoluble in chloroform. A hot amylic alcohol solution of solanin gelatinizes upon cooling, even though but little solanin be present.

Sulphuric acid turns solanin to an orange-yellow color, after which it dissolves it and such solution turns brown.

When solanin is present in an organic mixture a modification of Stas' process is employed for its determination.

ANESTHETICS.

Chloroform and Chloral.

Such organic mixtures as the contents of the stomach usually retain the odor of chloroform for some time. After distilling such mixtures on a water bath, the distillate should be redistilled with calcium chlorid, and then the proper tests for odor, solubility, etc., applied. When heated with an alcoholic solution of caustic potash and a few drops of anilin, chloroform gives off an unpleasant odor, similar to that of witch hazel. After chloroform has been

extracted from the stomach by distillation, it may be tested by passing the vapor through a flame, whereby decomposition into carbon, chlorine, and hydrochloric acid will occur. The carbon is easily recognized by its black deposit; the hydrochloric acid by its turning blue litmus red; the chlorine by its effect upon starch paper which has been dipped in a solution of potassium iodide, the iodine being set free by the decomposition of the potassium iodide, the starch turns blue.

Chloral.—In testing for chloral, the chloral should be converted into chloroform by mixing with an alkali.

After the solid matters have been properly divided they should be diluted with distilled water, sodium hydroxid added to alkalinity, then after heating in a flask, conduct the remainder of the examination as in chloroform analysis.

ANTIMONY.

Tartar emetic is the principal medicinal salt of antimony.

Tartar emetic is soluble in water, but not in alcohol. If a portion of tartar emetic is heated to redness, it chars, emits an odor of burning sugar, and leaves a black residue, having an alkaline reaction. If this is mixed with charcoal and heated in a small glass tube, a dark mirror-like ring of metallic antimony will form in the cooler portion of the tube.

A solution of tartar emetic treated with tincture of nutgall or solution of tannic acid gives a whitish-yellow precipitate of tannate of antimony.

Sulphuretted hydrogen gives an orange colored precipitate with antimony solution.

(See also Marsh's and Reinsch's Tests, described under arsenic.)

ANTIPYRINE.

Antipyrine gives a red color with ferric chloride; the color disappears upon adding a few drops of sulphuric acid.

Antipyrine gives a green color with nitric acid. To a solution add 12 drops of sulphuric acid, 2.5 grammes of sodium metaphosphate, filter and add a few drops of solution of sodium nitrate, and a green color is obtained.

ARSENIC.

Gives garlic-like odor when sublimed on charcoal or red-hot iron. When heated in glass tube it sublimes, forming small octahedral crystals on the sides of the tube. Sulphuretted hydrogen gives a yellow precipitate with arsenic. Ammoniated solution of cupric sulphate gives a green precipitate.

Marsh's Test: Introduce some pieces of zinc, free from arsenic and antimony, into a bottle holding about 150 c.c.; then pour over them sulphuric acid, diluted with 4 parts of distilled water; close the flask with a cork containing a funnel tube, which reaches nearly to the bottom of the bottle and a delivery tube, drawn to a fine point, into which a bulb containing a pledget of cotton has been introduced. After allowing the generation of hydrogen to go on for about half an hour, to expel the air from the upper part of the flask, light the gas at the open end of the delivery tube and hold a cold porcelain surface down upon the flame. If the zinc and sulphuric acid used contain no arsenic or antimony, no black stain will be produced on the porcelain. It thus being evident that the apparatus and materials are free from arsenic, put out the flame and pour the suspected fluid through the funnel tube so as to admit little or no air with it into the flask. Then ignite the gas and test the flame again with the cold porcelain surface. If a brilliant black or brown stain, soluble in a solution of chlorinated soda is obtained it is probably arsenic. If you moisten one of these spots with nitric acid it should disappear, then evaporate the acid over a lamp, moisten the spot with water, and hold the dish over a vessel containing sulphuretted hydrogen, prepared by the action of sulphuric or hydrochloric acid upon sodium or potassium sulphide.

If the stain was due to arsenic, the spot will turn lemon-yellow. The antimony mirror is insoluble in chlorinated soda (Labarraque's Solution), and after treatment as above, gives an orange stain. Now soften the glass, bend the delivery tube downward, and let it dip into a solution of silver nitrate; after an hour pour some very weak solution of ammonium hydroxide upon the surface of the silver nitrate solution. A yellow precipitate at the line of separation of the two liquids shows the presence of arsenic. If the substance to be tested is a solid, a small portion of it may be thrown upon glowing charcoal, when if arsenic be present, it will give a garlic-like odor.

[Various modifications of Marsh's test have been proposed by different writers; one, in which, instead of the use of porcelain, the arsenic is deposited in a drawn-out narrow tube, as advised by Otto and others.]

Reinsch's Test may also be employed as follows:

Boil the liquid suspected of containing arsenic, with one-sixth of its bulk of pure hydrochloric acid. Then, or before boiling, introduce a bright slip of copper when, if arsenic be present, it will coat the copper with an iron-gray deposit. Remove the copper, wash it with distilled water and dry it between folds of blotting paper. Then cut it into slips, introduce it into a reduction tube and apply heat, when, if arsenic be present, arsenous acid will be sublimed and deposited on the sides of the tube in minute octahedral crystals. These may be dissolved in water and tested by the various reagents.

Antimony deposits nearer the copper than arsenic does, and it produces a blue or violet tinted deposit on the copper foil. The interference encountered by the presence of organic matter in the suspected mixture may be overcome by separating the arsenic by dialysis.

The copper and hydrochloric acid used in the above process should have been previously tested as to purity by boiling the copper with a mixture of the acid and distilled water.

When arsenic is supposed to be present in organic matters, a distillation process may advantageously be resorted to as follows: Dry the suspected matters on a water bath, not using too great heat. Then introduce them into a flask fitted with a long bent tube; add a quantity of strong hydrochloric acid (previously proved free from arsenic), sufficient to drench the material. Digest the whole for several hours. Then apply heat to the flask by means of a sand-bath and a receiver, containing a little water, fitted to the bent tube. Both receiver and tube should be kept cool. By this distillation process arsenic passes over in the form of arsenous chloride and is collected in the receiver. An additional portion of hydrochloric acid may be used to remove any traces of arsenic in the organic material. The arsenic may be obtained from the chloride by boiling with pure polished copper, as described above in Reinsch's process.

BARIUM SALTS.

A few drops of sulphuric acid dropped in the suspected fluid gives a white precipitate, insoluble in nitric acid.

[If the barium is in a colored menstrum, it should be bleached with chlorine; then drive off the chlorine by heat before applying the test.]

Burnt on platinum wire barium salts give a greenish flame.

BELLADONNA AND ATROPINE.

Treat the suspected substance with a few drops of concentrated sulphuric acid and warm. If atropine be present an odor resembling a mixture of roses and orange flowers develops; on now gradually adding a few minute fragments of potassium dichromate, the odor will change to that of bitter almonds; the color will be green.

Atropine dilates the pupils when a drop of a very weak solution is introduced into the eye.

In suspected poisoning by Belladonna, the vomit

stools and stomach contents should be thoroughly examined for seeds, berries, or the remains of leaves or root.

The stomach and its contents should be thoroughly comminuted, then acidified with warm alcohol and acetic acid. The mixture should then be filtered and the filtrate treated with sulphuretted hydrogen and lead subacetate, thus precipitating lead sulphide. The clear filtrate should then be evaporated to dryness, acidified, saturated with solution of potash in excess, and after the addition of alcohol suitable identification tests may be applied to the extract.

BRUCINE.

Nitric acid dissolves it and colors it blood-red. By then adding solution of protochloride of tin, color changes to deep violet.

CANTHARIDES.

If the cantharides be undissolved, there are shining green pieces of the drug.

Water gives a white precipitate when added to the alcoholic solution, the precipitate being afterwards soluble in an excess of water.

By exhausting the suspected material with ether, cantharidin may be separated out of it. The ethereal solution may then be evaporated until nearly dry, and spread on oiled silk. If upon applying it to the skin, it blisters, cantharidin is present.

CARBONIC ACID GAS.

When the gas is present in the proportion of 12 to 15 per cent. it extinguishes a candle.

Agitating solution of lime or solution of subacetate of lead in this gas produces a white precipitate in the solution.

Agitating a litmus-blued solution of chloride of lime in the gas drives off the color, which is evidence that it is not nitrogen.

COPPER SALTS.

Whether in solution or not, all cupric salts are blue and green. The reaction of the solution is usually acid.

To a suspected solution add solution of ammonia, a bluish-white precipitate is produced, soluble in excess of the ammonia, producing a violet-blue solution when copper is present.

Potassium ferrocyanate gives a chocolate-brown precipitate or reddish-brown color, if copper is present, although only in small quantities.

Sulphuretted hydrogen gives a deep brownish-black precipitate when added to a solution of a copper salt.

If polished steel is suspended in a copper solution, it speedily becomes coated with copper.

Pour the suspected solution on a platinum plate, acidulate with nitric acid, then touch the platinum passing through the solution, with a slip of zinc, and if copper is present, it will deposit upon the platinum.

In examining such organs as the kidneys, liver, etc., for the presence of copper, the organ or organs under examination should be incinerated, the resulting ash treated with dilute hydrochloric or sulphuric acid and the various tests for copper applied. In examining vomited matter or stomach contents, they should be diluted, if necessary, stirred and allowed to stand in a conical vessel for several hours. To the clear fluid which separates the various tests for copper may be applied as above given.

CREOSOTE.

Creosote has a peculiar smoky odor, and instantly coagulates albumen.

With Ferric Chloride creosote gives a violet colored solution, rapidly changing to green, then brown and forming a brown precipitate. Phenol gives a purple colored solution.

Creosote is not soluble in glycerine; phenol is, Creosote does not coagulate collodion; phenol does.

FORMALDEHYDE.

Dissolve a decigram of morphine in 1 c.c. of sulphuric acid; gently add, without mixing, an equal volume of the suspected liquid; if there be any formaldehyde present the liquid will soon assume a red violet color.

ILLUMINATING GAS.

Blood charged with illuminating gas does not coagulate. When shaken a distinct froth forms.

The blood is of a bright cherry color, which is persistent.

If to the blood which has taken up illuminating gas a 5 per cent. solution of caustic soda be added, the bright red color of the blood will be maintained or intensified; whereas in normal blood the color will change from red to green and later a dark brown.

Hemoglobin in combination with carbon monoxide is not changed by adding reducing agents. The oxy-hemoglobin of ordinary blood is changed. Both kinds of blood show two absorption bands when examined through the spectroscope, but they vary slightly in position. Upon adding a reducing agent to ordinary blood, the two bands disappear and a broad band of reduced hemoglobin appears in their place. This does not occur with the blood which is saturated with the gas if more than 27 per cent. of the hemoglobin be saturated with carbon monoxide.

Rubner's test for carbon monoxide in blood, is: Shake the blood with 4 or 5 volumes of lead acetate in solution; if the blood contains carbon monoxide, it will retain its bright color; if not, it becomes a chocolate-brown.

IODINE.

Free iodine turns gelatinized starch blue.

Acetate of lead gives a yellow precipitate of lead iodide. By sublimation a violet or purple vapor is produced.

To a solution of an iodide add nitrate of silver solution, a pale yellow precipitate results, insoluble in nitric acid or ammonia water.

Potassic iodide gives a scarlet precipitate with a solution of bichloride of mercury.

Iodides mixed with starchy solutions and treated with chlorine gas or nitrous acid give a blue color.

When iodine is combined as in the form of an iodide or iodoform, it must be set free in order to test it. The urine or stomach contents suspected to contain such should first be digested with distilled water, then filtered. If upon adding first some chlorine water and then a few drops of starch paste to a little of this filtrate, a blue color is obtained, the presence of iodine in the above combined form, in the original solution, is indicated. Free iodine would be indicated by a blue color obtained in the same way, but omitting the chlorine water.

LEAD.

Solution of potassic sulphate will give a white precipitate. Sulphuretted hydrogen gives a black precipitate. Potassic chromate produces a yellow precipitate. Dissolve in acetic acid, add potassic iodide, which gives a yellow plumbic iodide precipitate.

MERCURY SALTS.

Salts of mercury are either mercuric or mercurous.

The most important salt of mercury, from a toxicological standpoint, is corrosive sublimate (mercuric chloride). This and other *mercuric salts* are identified by the following tests:

With potassium iodide solution, a scarlet precipitate is formed, which dissolves upon adding excess of the potassium iodide solution.

With solutions of soda or potash, a yellow precipitate is formed.

Heated with sodium carbonate in a tube, globules of metallic mercury are formed.

Upon a bright gold surface drop some of a solution of the suspected poison, when, if corrosive sublimate be present, it will form an amalgam when the gold surface is touched by the point of a knife through the fluid.

Mercurous salts, such as mercurous nitrate, calomel, etc., are identified by giving a black precipitate with alkaline hydroxides, a greenish-yellow precipitate with potassium iodide.

If a solution of stannous chloride be added to a suspected mercury salt solution, a white and gray precipitate consisting of metallic mercury and calomel is produced.

In the examination of suspected urine it should be evaporated to dryness by gentle heat on a water bath. The residue should then be dissolved in distilled water with a few drops of hydrochloric acid boiled and filtered, when the various tests for mercury salts may be employed.

NITROBENZOL.

When nitrobenzol is mixed with organic matter, it may be separated by distillation, after having added sulphuric acid.

NUX VOMICA AND STRYCHNINE.

Adding nitric acid to an aqueous infusion of nuxvomica gives a bright red color.

Adding ferric chloride to aqueous infusion of nuxvomica gives a green color.

No change occurs upon dissolving strychnine in sulphuric acid; however, if we add an oxidizing agent, such as potassium bichromate, manganese dioxide, lead peroxide, etc., a play of colors from deep blue to purple, violet, rapidly changing to red or crimson, and orange-yellow, results. Quebrachine is the only alkaloid substance which produces the same colors in the same order, but it differs from those of strychnine in the intensity and duration of the color play; and que-

brachine dissipates on heating on a water-bath, strychnine does not.

After being absorbed, strychnine is deposited in the various organs like mineral poisons. It is usually found in the liver and kidneys, but has been discovered in the blood, spleen, brain, heart, etc. To detect it, it is necessary to finely subdivide the suspected tissues and digest them in alcohol acidulated with sulphuric acid. The mixture is then cooled, filtered and concentrated, the residue washed with acidulated alcohol, and evaporated. Chloroform is then employed the same way, and after evaporation the residue is purified and suitable identification tests applied.

OPIUM AND MORPHINE.

Ferric chloride gives a deep red color with an aqueous solution of opium.

Also apply tests for morphine.

In making a toxicological examination for the detection of opium in the stomach, vomit or tissues, the stomach contents should first be examined for particles of undissolved opium, and an effort made to discover the odor of opium or one of its preparations.

In examining vomited matter, or the stomach contents, such should be finely divided, if in a solid state, distilled water added until a thin paste is secured, the mixture acidulated with tartaric or acetic acid, and then digested over a water-bath for about an hour. It should then be filtered and the filtrate evaporated. Two or three volumes of 95 per cent. alcohol should then be added to precipitate the organic matter and the mixture should be well stirred. The insoluble material should then be separated by filtration, and the filtrate evaporated, thus removing the alcohol. The residue should then be dissolved in water acidulated with tartaric or acetic acid, to still further separate extraneous organic matter, after which it should again be filtered. A slight excess of lead acetate should now be added to the filtrate until there is no further precipitation. The

precipitate produced is insoluble lead meconate and contains the meconic acid, if such were present in the materials under examination. After allowing the precipitate to stand, it should be placed on a filter and washed with distilled water. The substance on the filter should now be analyzed for meconic acid; the filtrate should be analyzed for morphine, it being present in that solution as an acetate.

Process A. Separation of the meconic acid:

Slightly wash the material on the filter with distilled water, to dissolve out any soluble portions. Then wash the precipitate from the filter into a beaker; after which pass sulphuretted hydrogen through the contents of the beaker, thus precipitating the black insoluble lead sulphide, leaving the meconic acid in solution. Then filter the mixture to remove the lead sulphide. The filtrate contains the meconic acid and should be concentrated by evaporation, after which it may be tested by adding a little ferric chloride to a portion of it to determine the presence of meconic acid. With ferric chloride, a red color would be produced, which would not be destroyed by strong mineral acids. If another portion of the filtrate be taken and concentrated by evaporation, the meconic acid may crystallize out if present in sufficient quantity.

Process B. Separation of the morphine:

The filtered liquid which contains the morphine acetate together with the lead acetate in excess, should be taken and treated with sulphuretted hydrogen, by passing the latter through it to saturation, thus removing the excess of lead acetate, the lead being converted into the insoluble sulphide. In order that the sulphide may settle, the mixture should be allowed to stand in a warm place for a number of hours. The sulphide may then be separated by filtration. It may then be evaporated by a gentle heat, placed in a test tube, a slight excess of ammonia added, then a double volume of amyl alcohol, the mixture thoroughly shaken and allowed to stand. In a short time the amyl alcohol will rise to the top of the tube and may be removed by

using a pipette. Then another portion of amyl alcohol is used to repeat the operation, the two portions mixed, and a gentle heat employed to evaporate this mixture. A microscope should then be used to examine the residue for morphine.

Before applying the characteristic tests for morphine, all impurities and foreign matter should be separated from the residue; this is done by dissolving the residue in a little dilute acetic acid and then filtering the mixture. The morphine may then be left unaffected and all impurities taken up, by making the remaining fluid alkaline with potassium carbonate, and shaking the mixture with hot amyl alcohol added in double volume. The various tests for morphine may then be applied.

Regarding the detection of morphine in the organs and tissues, the organ to be examined should be finely subdivided and subjected to the same course of procedure as detailed above for the examination of vomited matter or stomach contents.

To powder supposed to be morphine, or to strong cold solution supposed to contain morphine, add strong nitric acid in excess and an orange-red color will be produced, which slowly fades to yellow and is not changed to purple upon adding stannous chloride, as occurs with brucine.

Solution of ferric chloride neutralized by potash gives an inky-blue color when applied to a cold and not very acid solution. (As phenol, gallic acid, tannic and salicylic acids give a similar color, care should be taken to insure their absence.)

Iodic acid mixed with starch produces a purplish or deep purple color when added to a cold and not very acid solution.

(Husemann's Delicate Morphine Test):

Heat the suspected liquid to 150° F. for a few minutes with concentrated sulphuric acid; let it cool and add a trace of potassium chlorate or chlorine water; a blue to violet-red color, changing to blood-red and finally disappearing, is produced.

PHOSPHORUS.

Mitscherlich's process is usually employed for detecting phosphorus.

The organic matters supposed to contain phosphorus are made fluid by diluting them with distilled water, and then acidified with sulphuric acid. They are then placed in a flask and put upon a sand-bath and the flask connected with a Liebig's condenser and placed in absolute darkness. When the flask is heated, the phosphorus present is volatilized, and upon its condensing in the tube a luminous ring is formed, which is evidence of the presence of phosphorus. If alcohol, ether or oil of turpentine are present the luminosity of the phosphorus will be destroyed. Hence this process would in such case be useless.

SILVER NITRATE.

An aqueous solution of silver nitrate gives with hydrochloric acid a white precipitate of silver chloride, soluble in ammonia.

All the chlorides precipitate a solution of silver nitrate in the form of a white powder, which blackens by light.

Potassium chromate gives a dull red precipitate, soluble in acids.

TIN.

Tin compounds give a white precipitate, becoming gray and black, with mercuric chloride. They give a dark-brown precipitate with H_2S , soluble in alkaline sulphides, in potassium hydroxide, and also in hot water. They also give a white precipitate, with ammonium hydroxide, which turns olive-brown when the fluid is boiled.

TYROTOXICON.

Tyrotaxon forms crystals with potassium hydrate.

When treated with a mixture of carbolic and sulphuric acids, a green color is produced.

In whey, tyrotaxon varies in color from yellow to orange-red.

ZINC.

Zinc Sulphate :

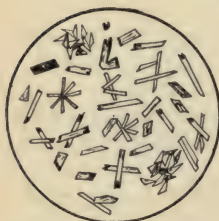
Potassic chromate precipitates yellow zinc chromate.

Ammonium sulphide in the presence of ammonium hydroxide gives a white precipitate.

Potassium ferrocyanide gives a gelatinous white precipitate.

CRYSTALS.

(Under the Microscope.)



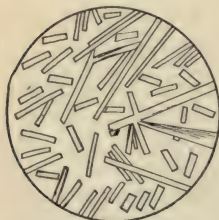
Strychnine (Alc. sol.).



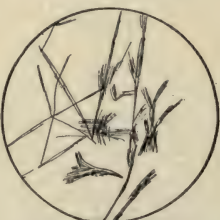
Morphine (Alc. sol.).



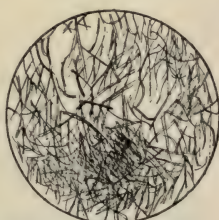
Atropine (+KHO)



Oxalic Acid (Alc. sol.).



Carbolic Acid, from dilute and conc. solutions.
(From analysis of organs, etc., in a case of
fatal poisoning by Carbolic Acid.)



This and the following chart, by Thompson of England, are worthy of the analyst's consideration :

"A CONDENSED CHART FOR THE DETECTION OF METALS IN SOLUTION."

GROUP I.	GROUP II.	GROUP III.	GROUP IV.	GROUP V
<p>Add HCL</p> <p>Lead. $\left\{ \begin{array}{l} \text{Mercurous} \\ \text{Salt.} \end{array} \right\}$</p> <p>White ppt. $\left\{ \begin{array}{l} \text{Silver.} \\ \text{Bismuth or} \\ \text{Antimony} \\ \text{as oxychloro-} \\ \text{rates.} \end{array} \right\}$</p> <p>Add excess HCL</p> <p>ppt. $\left\{ \begin{array}{l} \text{Bismuth} \\ \text{dissolves} \end{array} \right\}$ or Anti- if mony.</p> <p>If precipitate does not dissolve, <i>boil</i>; if dissolved, Lead is indicated. If unchanged add ammonia.</p> <p>Precipitate dissolves = <i>Silver</i>.</p> <p>Turns <i>black</i> = <i>Mercury</i>.</p>	<p>Pass H_2S into solution.</p> <p>Black ppt. $\left\{ \begin{array}{l} \text{Mercuric Salt.} \\ \text{Copper.} \\ \text{Bismuth.} \end{array} \right\}$</p> <p>Add Sol. Pot. Iodid. to same. If it turns</p> <p>Red = Mercury.</p> <p>Green = Bismuth.</p> <p>Yellow = Lead.</p> <p>Brown = Copper.</p> <p>Yellow $\left\{ \begin{array}{l} \text{Arsenic.} \\ \text{ppt. with} \\ \text{H}_2\text{S.} \end{array} \right\}$</p> <p>Add to same</p> <p>Ammon. Sulphyd.</p> <p>Arsenic = dissolves.</p> <p>Tin = dissolves.</p> <p>Cadmium = insoluble.</p> <p>If ppt. is dissolved add HCL.</p> <p>Arsenic is precipitated, Tin is not.</p> <p>Brown ppt. with H_2S = Stannous Salt.</p> <p>Orange ppt. with H_2S = Antimony.</p>	<p>Add AmCL AmHO (till it smells when shaken).</p> <p>AmHS (a little).</p> <p>Black $\left\{ \begin{array}{l} \text{Iron.} \\ \text{Cobalt.} \end{array} \right\}$</p> <p>ppt. $\left\{ \begin{array}{l} \text{Cobalt.} \\ \text{Nickel.} \end{array} \right\}$</p> <p>To original solution add $K_4Fe_2Cy_{12}$.</p> <p>Blue ppt. = Iron.</p> <p>Plum color ppt. = Cobalt.</p> <p>Yellowish ppt. or none = Nickel.</p> <p>White $\left\{ \begin{array}{l} \text{Alum.} \\ \text{ppt.} \end{array} \right\}$ Zinc.</p> <p>To original solution add K_4FeCy_6.</p> <p>White ppt. = Zinc.</p> <p>No ppt. = Alum.</p> <p>Green ppt. = Chromium.</p> <p>The AmHS and AmHO must give a green ppt. for Cr.</p> <p>If white with AmHO, Al or Fe is indicated.</p> <p>Flesh color ppt. = Manganese.</p>	<p>Add to last solution Am_2CO_3.</p> <p>White $\left\{ \begin{array}{l} \text{Barium.} \\ \text{Strontium.} \end{array} \right\}$ Calcium.</p> <p>Dissolve the ppt. in Acetic Acid and add K_2CrO_4.</p> <p>Yellow ppt. = Barium.</p> <p>If <i>no ppt.</i>, add H_2SO_4. Dilute = White ppt. on standing or shaking = Strontium.</p> <p><i>No ppt.</i>, add $Am_2C_2O_4$.</p> <p>White ppt. = Calcium.</p>	<p>Add to original solution Na_2HPO_4.</p> <p>White ppt. = Magnesium.</p> <p>If no ppt. is obtained in either group, Potassium, Sodium or Ammonia are indicated.</p> <p><i>Potassium</i>.</p> <p>Yellow ppt. with Pt Cl_4.</p> <p>White ppt. with strong solution of Acid. Tart.</p> <p><i>Sodium</i>. No ppt. with above and yellow flame.</p> <p><i>Ammonia</i>. Heat with KHO, gas evolved. (Nessler's test.)</p>

"CHART FOR THE DETECTION OF ACIDULOUS RADICALS OF SALTS IN SOLUTION," (THOMPSON.)

DISSOLVE THE SALT IN WATER, AND RENDER IT NEUTRAL, IF NECESSARY.

GROUP I. H_2SO_4 . Decomposes.	GROUP II. $BaCl_2$. Precipitates.	GROUP III. $CaCl_2$. Precipitates.	GROUP IV. $AgNO_3$. Precipitates.	GROUP V. Fe_2Cl_6 . Precipitates.	GROUP VI. $H_2SO_4 + FeSO_4$. Forms a black colouration.
Sulphites. Sulphides. Carbonates. Cyanides. Acetates.	Oxalates, <i>White</i> . Tarrates " Citrates " Sulphates " Phosphates "	Oxalates, <i>White</i> . Tarrates " Citrates " Phosphates "	Chlorides, <i>White</i> . Tarrates " Bromides, <i>Yellowish</i> . <i>White</i> . Iodides, <i>Yellow</i> . Phosphates " Chromates, <i>Red</i> . Arsenates, <i>Chocolates</i> . Arsenites, <i>Yellow</i> .	Ferrocyanides, <i>Blue</i> . Borates, <i>Yellowish</i> .	Nitrates.

- Group I. H_2SO_4
- Group II. $BaCl_2$
- Group III. $CaCl_2$
- Group IV. $AgNO_3$
- Group V. Fe_2Cl_6
- Group VI. $H_2SO_4 + FeSO_4$
- { Apply heat, and notice any odour which may be evolved.
Sulphides give off H_2S (sulphuretted hydrogen). Confirm.
Sulphites give off SO_2 (sulphurous acid gas). Confirm.
Carbonates effervesce and give off CO_2 (carbonic acid gas). Confirm.
Cyanides give off the odour of H_2C_2 (hydrocyanic acid). Confirm.
Acetates give off the odour of acetic acid. Confirm.
- { Should the precipitates produced by this reagent be insoluble in HNO_3 , a sulphate is indicated.
Should the precipitate be soluble, pass on to Group III.
- { Should the precipitate produced by this reagent be insoluble in acetic acid, but soluble in HCl , the presence of an oxalate is indicated. Confirm. Tartrate of calcium is also insoluble in acetic acid, an acid tartrate of calcium being formed, which may be distinguished from the amorphous oxalate of calcium by its crystalline character. Confirm. Should the precipitate be soluble in acetic acid, test for citrates.
- { The colour of the precipitates by this reagent is very characteristic. If the precipitate is white and insoluble in HNO_3 , but soluble in dilute solution of ammonia, the presence of a chloride is indicated. Confirm.
- A yellowish precipitate indicates a borate. Confirm.
- { Should the previous reagents give no precipitate, add a crystal of sulphate of iron and a few drops of strong sulphuric acid. The formation of a black colour indicates a nitrate. Confirm.

PART V.

OUTLINE OF PROCEDURE IN SEARCHING FOR POISONS.

Those portions of the body which are to be subjected to chemical or microscopical examinations, should be carefully placed at the time of the autopsy, by the person performing it, in new, or thoroughly clean glass jars, having air-tight glass covers. Where prompt analysis is to be made, neither alcohol nor any other preservative fluid should be added. When such is added, it should be distilled alcohol and known to be pure; and a carefully sealed and labeled portion of it should be preserved for the chemist to test for impurities. The jars should be sealed, numbered and labeled, and the sealer should affix his initials. The portions of the body to be preserved for the chemist's examinations, are, as a rule, the stomach and contents, a portion of or the whole intestinal canal, the liver, both kidneys, the spleen, the brain, the urine found in the bladder, and upon occasion, the heart, lungs, a portion of or the entire spinal cord, and a portion of muscle taken from the leg. When it is desirable, but impossible to obtain the whole of an organ, the proportion which the part obtained bears to the whole organ should be ascertained. Careful inspection should be made of all organs, sometimes also by a pathologist and a bacteriologist, to exclude other cause of death than by poisoning.

In removing the stomach and its contents from a body for examination, a double ligature should be passed around the esophagus just above the cardiac orifice, and another about the duodenum three or four inches below the pylorus, and the organ removed with its contents thus intact. It is frequently advisable to place each organ intended for analysis in a separate glass jar or other container.

It is rarely necessary to analyze the whole body. As a rule the following are the organs to be examined,

and in this order: the stomach and contents, the liver, spleen, kidneys, heart, lungs and brain; it may, however, be necessary to also examine the spinal cord, uterus, portions of intestines, the blood, etc.

When the material to be analyzed consists of either solids, or solids and liquids to be analyzed together, the solids should be reduced to a finely divided mass, and any liquid portion so mixed with it as to make the whole a uniform mixture. If there be an insufficient quantity of liquid present, it may be necessary to add some distilled water in order to secure a uniform mixture. The mixture should now be weighed and about one-twelfth or one-fifteenth (not over one-tenth) weighed out and employed for preliminary tests. Is proper in systematic analysis to search first for volatile poisons, then alkaloids, then inorganic poisons.

In testing vomited matters, a clear liquid, serviceable for preliminary tests, may usually be obtained by placing them in a cone-shaped glass vessel, and setting them aside for 12 to 24 hrs. In absence of much fluid a small quantity of distilled water may be added and well mixed with these matters before setting them aside.

In making chemical analyses, dialysis is often resorted to, to separate the poison (especially any crystallizable salt) from the complex matters associated with it; either alcohol or water, according to their ability to dissolve the poison, is used as the outer liquid.

During life all the body tissues are alkaline except those of the stomach and the urinary apparatus. For a short period after death all the tissues become more or less acid, but soon change to alkaline, owing to the production of ammonia through the process by which the proteids are changed into waste matter and cast out. The tissues which contain sulphur ultimately change into hydric sulphide, precipitating the sulphides of mercury, lead, arsenic, etc. The hemoglobin of the blood becomes converted into sulphuret-hemoglobin, and ultimately into ferrous sulphate. These two compounds give the body a greenish color in the earlier periods of decomposition.

The analyst, upon receiving the samples or materials for analysis, should note accurately the manner in which they have been packed, that the container was well closed and tightly sealed, and that the seals have not been disturbed; also, whether the container or wrappings were likely to contaminate the samples, the character and wording of the labels, if there be such, and the date and agent of receipt.

Careful observation should then be made of the appearance, smell, color, weight of each solid, the volume of liquid, and the reaction of the samples.

Opium, hydrocyanic acid, or alcohol may be suggested by the smell. The salts of copper, portions of insects, or certain arsenical preparations, or other coloring matter may be suggested by the color. Spots which are characteristic of the sulphides of mercury, lead, arsenic, etc., may occasionally be found long after interment, on or in various organs of the body.

In making his chemical analysis the investigator must insure the purity of the atmosphere of the room in which the investigation is made, the security of the samples in such room, it being accessible only to the analyst, and the perfect freedom of his apparatus from contamination. He must also determine the absolute purity and reliability of his test solutions, by testing them. He should make notes of his work.

A careful hand magnifying-glass and microscopical examination of the suspected organs and their contents is often advisable; the identification and subsequent exhibition of characteristic substances and forms is thus provided for. Before a suspected organ is destroyed in process of investigation, it is often well to photograph it.

The nature of the food last eaten and its bearing on the case is frequently a matter of the utmost importance. Washings of samples and containers should be included in the investigation.

It is as a rule advisable to examine only one portion of the vomited matter, stomach contents, or intestinal

contents, at one time. The other portions should be reserved for subsequent experiments. Inasmuch as the poison may be present in only a very small quantity, the portion of fluid under examination should be concentrated, by evaporation at a gentle heat, to secure the best responses to the various tests. Separation of materials under examination may require resort to dialysis—as in the separation of colloid substances from crystalloids—or to distillation—as in such volatile substances as alcohol, chloroform, prussic acid, phosphorus, chloral, etc.—as well as to such processes as filtration, etc. In the search for an inorganic poison (as antimony, arsenic, etc.) in the presence of organic matter, Fresenius' process is commonly resorted to for the destruction of the organic matter. By this process, the material to be tested, is, after being finely divided, boiled with about one-eighth of its bulk of pure hydrochloric acid, occasionally adding crystals of potassium chlorate, allowing sufficient time each time for the chlorate to decompose, until the materials under investigation are oxidized to a straw-colored fluid; then hydrogen sodium sulphite is added until the mixture gives off an unmistakable odor of sulphurous acid. Most of the metallic poisons are then precipitated in the form of a sulphide by passing sulphuretted hydrogen through the mixture for several hours. By collecting such precipitate, the various tests for identification may be applied.

Poisonous alkaloids are advantageously separated from complex mixtures, by means of either Stas' Roger and Girdwoods, or Uslar and Erdmann's method. Stas uses ether as a solvent. Uslar and Erdmann resort to alcohol.

In Stas' process for separating alkaloids, the following course is pursued: The stomach or intestinal contents, or the solid organs to be tested are digested with acidulated alcohol or water, until such are in a state of solution. Then the whole is filtered and ether added to the filtrate. The ether removes the oily mat-

ters, and is itself then removed and the watery solution neutralized by adding potash or soda. The alkaloid is ultimately separated by ether, when it may be expected to remain behind in suitable condition for the employment of further tests. Some analyzers prefer to modify Stas' process. One of these modifications consists in acidulating the suspected material with hydrochloric acid, then heating it for an hour or more over a water-bath, and filtering the mixture. This process is continued until a pure product is obtained. This product is neutralized by adding hydrogen sodium carbonate, and the freed alkaloid is taken up by shaking the mixture with chloroform or ether. If the mixture then be put in a tall, tightly corked test tube and allowed to stand, the chloroform or ether may be separated by means of a pipette, and upon evaporation the alkaloid will be found ready for additional purification or testing.

The toxicologist resorts to a variety of methods in his efforts to detect traces of poison in suspected substances.

Herold very tersely says: "Combinations are formed with other elements, revealing the poison in the form of solids, liquids or gases. Others are arrayed in varied colors, in crystalline shapes, or volatilized in flame and viewed by the achromatic or apochromatic lenses of the microscope, or their incandescent vapors through the prisms of the spectroscope. For example, the existence of metals is indicated by brilliantly tinted and sharply defined lines, as they are presented in front of the narrow slit of the spectroscope, even infinitesimal traces being accurately noted."

"The great advances made in electricity have contributed the mysterious power of this fluid in toxicological analyses, as is exemplified in the production of ozone for the purple-color reaction for strychnine, or in evolving hydrogen from distilled water for the 'Marsh test.' (Doremus.)"

A SHORT ANALYTICAL PLAN.

A systematic analysis for the detection of poison may be resolved into two principal procedures: 1. Analysis for volatile and inorganic poisons. 2. Analysis for non-volatile organic poisons.

Having reduced the materials to be examined to a uniform mixture by means of thorough division, and, if necessary, also by dilution, a small and carefully weighed portion may be taken for the application of simple preliminary tests. Then the remaining portion may be divided into either three or four parts: one part for the first procedure, one for the second procedure, one part for control tests, and, if deemed advisable, one in reserve for use in case of accident. Each part should be carefully marked. The part provided for the first procedure, *the analysis for volatile and inorganic poisons*, is now acidified with tartaric or acetic acid and put into a distilling flask. The delivery tube is connected with a glass condenser, and the mixture distilled over a water-bath for about half an hour. The products of condensation should be received in a flask in which a little water has been placed. If, upon observing the reaction of the distillate it is found to be neutral, it may contain amyl, ethyl, or methyl alcohol, or anilin, amyl nitrite, carbon bisulphide, chloroform, chloral, coniin, carbolic acid, hydrogen sulphide, lobeline, nicotine, nitro-benzole, or phosphorus. If the distillate is found to be acid, hydrobromic, hydrochloric, or hydrocyanic acid may be present, and they may be identified by the ordinary tests.

The organic matter present in the residue left in the distilling flask should next be destroyed as follows: This residue should be placed in a good sized flask and dilute hydrochloric acid which is known to be free from arsenic, should now be added in sufficient quantity to cover the material, and the whole heated on a water-bath. Crystals of chlorate of potash, in small portions, at intervals sufficient to permit of the decomposition of the chlorate of potash are now introduced; this should be continued until the contents

of the flask present a clear straw-colored appearance. The object in introducing the chlorate of potash is two-fold: first, to oxidize the organic matter; second, to prevent the loss of arsenic through the vaporization of arsenous chlorid. The fluid in the flask is then to be cooled, and air should be drawn through the mixture with an aspirator, until all free chlorine has been expelled; the contents of the flask are then ready for testing for inorganic bases by the ordinary methods.

The portion reserved for the second procedure, i. e., analysis for non-volatile organic poisons, is now treated as follows:

It is put into a distilling flask and about three volumes of absolute alcohol which has been acidified with tartaric or acetic acid is added. Connection should then be made with a return condenser and water-bath heat applied for half an hour or more. The mixture should then be cooled, filtered, the residue washed with absolute alcohol, the washings added to the filtrate and the alcohol distilled off. Then add an equal quantity of water, mix well, filter, and place the filtrate in a cylindrical glass-stoppered jar. This filtrate contains the poison sought, and may be marked F.

Next, after having added an equal volume of ether, and shaken up the resulting mixture, permit it to separate and then remove the ethereal layer. After repeating this operation two or three times, put the extracts together and evaporate them to dryness on the water-bath.

Acetanilid, antipyrine, caffeine, cantharidin, colchicin, digitalin, phenacetin, picric acid, picrotoxin, piperin, salicylic acid, salol or santonin, may be contained in this extract, and by applying suitable tests to small portions of it, such may readily be identified.

The ethereal layer having been separated from the acid filtrate F., extract with chloroform in the same way as was done with the ether. The resulting extract may contain digitalin, helleborin, narcein or papaverin, for which suitable tests should be employed.

If the foregoing extractions have been fruitless, all chloroform should be expelled from filtrate F. by

warming the latter on the water-bath; it should then be placed in the glass-stoppered cylindrical glass jar, ammonia added to alkalinity, and extraction made by means of petroleum ether. Aconitin, apomorphine, atropine, brucin, cocaine, codeine, narcotine, pilocarpine, quinine, strychnine or veratrine may be contained in this extract. Suitable tests should then be employed for their identification.

If, however, this also results in nothing being obtained, amyl alcohol should be used to extract the alkaline liquid. This extract may contain morphine, and suitable tests should be applied for the identification of that alkaloid.

AUTENRIETH'S METHOD.

In searching for poisons, the general method of procedure of W. Autenrieth, according to Blyth, divides poisonous substances, for the purposes of separation and detection, into three classes:

I. Poisons capable of distillation from an acid aqueous solution.

II. Organic substances which are not capable of distillation from acid solutions.

III. Metallic poisons.

Where possible, the fluid or solids submitted to the research are divided into four equal parts, one of the parts to be kept in reserve in case of accident or as a control; one of the remaining three parts to be distilled; a second to be investigated for organic substances; and a third for metals. After the extraction of organic substances from part No. II, the residue may be added to No. III for the purpose of search after metals; and, if the total quantity is small, the whole of the process may be conducted without division.

I. SUBSTANCES SEPARATED BY DISTILLATION.

The substances are placed in a capacious flask, diluted if necessary with water to the consistence of

a thin soup, and tartaric acid added to distinct acid reaction, and distilled. In this way phosphorus, prussic acid, carbolic acid, chloroform, chloralhydrate, nitrobenzol, aniline (aniline is a weak base, so that, although a solution be acid, some of the aniline distills over on heating), and alcohol may be separated and identified by characteristic reactions.

II. ORGANIC POISONS NOT VOLATILE IN ACID SOLUTION.

Part No. II is mixed with double its volume of absolute alcohol, tartaric acid added to distinct acid reaction, and placed in a flask connected with an inverted Leibig's condenser; it is then warmed for 15 to 20 minutes on the water-bath. After cooling, the mixture is filtered, the residue well washed with alcohol and evaporated to a thin syrup in a porcelain dish over the water-bath. The dish is then allowed to cool and digested with 100 c.c. of water; fat and resinous matters separate, the watery solution is filtered through Swedish paper previously moistened. If the fluid filtrate is clear, it may be at once shaken up with ether, but if not clear, and especially if it is more or less slimy, it is evaporated again on the water-bath to the consistence of an extract: the extract treated with 60 to 80 c.c. of absolute alcohol (which precipitates mucus and dextrin-like substances), the alcohol evaporated off and the residue taken up with from 60 to 80 c.c. of distilled water; it is then shaken up with ether, as in Dragendorff's process, and such substances as digitalin, picric acid, salicylic acid, antipyrin and others separated in this way and identified.

After this treatment with ether, and the separation of the ether extract, the watery solution is strongly alkalized with caustic soda and shaken up

again with ether, which dissolves almost every alkaloid save morphine and apomorphine; the ethereal extract is separated and any alkaloid left is identified by suitable tests.

The aqueous solution, now deprived of substances soluble in ether both from acid and from solutions made alkaline by soda, is now investigated for morphine and apomorphine; the apomorphine being separated by first acidifying a portion of the alkaline solution with hydrochloric acid, then alkalizing with ammonia and shaking out with ether. The morphine is separated from the same solution by shaking out with warm chloroform (but hot amyl alcohol would be better).

III. METALS.

The substances are placed in a porcelain dish and diluted with a sufficient quantity of water to form a thin soup and 20 to 30 c.c. of pure hydrochloric acid added; the dish is placed on the water-bath and 2 grammes of potassic chlorate added. The contents are stirred from time to time, and successive quantities of potassic chlorate are again added, until the contents are colored yellow. The heating is continued, with, if necessary, the addition of more acid, until all smell of chlorine has ceased. If there is considerable excess of acid, this is to be evaporated away by diluting with a little water and continuing to heat on the water-bath. The dish with its contents is cooled, a little water added, and the fluid is then filtered. The metals remaining on the filter are: silver chloride, lead sulphate, barium sulphate. In the filtrate will be all the other metals.

The filtrate is put in a flask and heated to from 60 to 80 degrees and submitted to a slow stream of hydric sulphide gas; when the fluid is saturated with the gas, the flask is securely corked and allowed to rest for twelve hours; at the end of that time the fluid is filtered and the filter washed with water, saturated with hydric sulphide.

The still moist sulphides remaining on the filter are treated with yellow ammonium sulphide containing some free ammonia and washed with sulphide of ammonium water. Now remaining on the filter, if present at all, will be: mercury sulphide, lead sulphide, copper sulphide, cadmium sulphide. In the filtrate may be arsenic sulphide, antimony sulphide, tin sulphide; and there may also be a small portion of copper sulphide, because the latter is somewhat soluble in a considerable quantity of ammonium sulphide.

The filtrate from the original hydric sulphide precipitate will contain, if present, the sulphides of zinc and chromium in solution.

INVESTIGATION OF THE SULPHIDES SOLUBLE IN AMMONIUM SULPHIDE, VIZ., ARSENIC, ANTIMONY, TIN.

The ammonium sulphide solution is evaporated to dryness in a porcelain dish, strong nitric acid added and again dried. To this residue a little strong caustic soda solution is added, and then it is intimately mixed with three times its weight of a mixture composed of 2 of potassic nitrate to 1 of dry sodium hydrate. This is now cast, bit by bit, into a red-hot porcelain crucible. The whole is heated until it has melted into a colorless fluid.

Presuming the original mass contained arsenic, antimony, and tin, the melt contains sodic arseniate, sodic pyro-antimonate, sodic stannate, and tin oxide; it may also contain a trace of copper oxide.

The melt is cooled, dissolved in a little water, and sodium bicarbonate added so as to change any caustic soda remaining into carbonate, and to decompose the small amount of sodic stannate; the liquid is then filtered.

The filtrate will contain the arsenic as sodic arsenate, while on the filter there will be pyro-antimonate of soda, tin oxide, and, possibly, a little copper oxide.

The recognition of these substances now (by chemical methods) is not difficult.

**INVESTIGATION OF THE SULPHIDES INSOLUBLE IN
SULPHIDE OF AMMONIUM, VIZ., MERCURY,
LEAD, COPPER, CADMIUM.**

If the precipitate is contaminated with organic matter, it is treated with hydrochloric acid and potassic chlorate in the manner already described.

Afterwards it is once more saturated with hydric sulphide, the precipitate is collected on a filter, well washed, and the sulphides treated with moderately concentrated nitric acid (1 vol. nitric acid, 2 vols. water). The sulphides are best treated with this solvent on the filter; all the sulphides mentioned, save mercury sulphide, dissolve and pass into the filtrate. This mercury sulphide may be dissolved by nitro-muriatic acid, the solution evaporated to dryness, the residue dissolved in water acidified with hydrochloric acid and tested for mercury.

The filtrate containing, it may be, nitrates of lead, copper and cadmium, is evaporated nearly to dryness and taken up in a very little water. The lead is separated as sulphate by the addition of dilute sulphuric acid.

The filtered solution, freed from lead, is treated with ammonia to alkaline reaction; if copper be present, a blue color is produced, and this may be confirmed by other tests. To detect cadmium in the presence of copper, potassic cyanide is added to the blue liquid until complete decolorization, and the liquid treated with hydrogen sulphide; if cadmium is present, it is thrown down as a yellow sulphide, while potassic cupro-cyanide remains in solution.

SEARCH FOR ZINC AND CHROMIUM.

The filtrate from the hydric sulphide precipitate is divided into two parts—the one half is used in the search for zinc, the other half is used for chromium.

Search for Zinc.—The liquid is alkalized with ammonia, and then ammonium sulphide is added. There will always be a precipitate of a dark color; the precipitate will contain earthy phosphates, iron, and in some cases, manganese. The liquid with the precipitate is treated with acetic acid to strong acid reaction and allowed to stand for several hours. The portion of the precipitate remaining undissolved is collected on a filter, washed, dried and heated to redness in a porcelain crucible. The residue thus heated is cooled and dissolved in a little dilute sulphuric acid. To the acid solution ammonia is added, and any precipitate formed is treated with acetic acid; should the precipitate not completely dissolve, phosphate of iron is present; this is filtered off, and if hydrogen sulphide be added to the filtrate, white zinc sulphide will come down.

Search for Chromium.—The second part of the hydrogen sulphide filtrate is evaporated to a thin extract, mixed with double its weight of sodic nitrate, dried and cast, little by little, into a red-hot porcelain crucible. When the whole is fully melted, the crucible is removed from the flame, cooled, and the mass dissolved in water and filtered. Any chromium present will now be in solution in the easily recognized form of potassic chromate.

INVESTIGATION OF THE RESIDUE AFTER THE TREATMENT OF THE ORIGINAL SUBSTANCE WITH HYDROCHLORIC ACID AND POTASSIC CHLORATE FOR PRESENCE OF SILVER CHLORIDE, LEAD AND BARIUM SULPHATES.

The residue is dried and intimately mixed with three times its weight of a mixture containing 2 parts of sodic nitrate and 1 part of sodium hydrate. This is added, little by little, into a red-hot porcelain crucible. The melted mass is cooled, dissolved in

a little water, a current of carbon dioxide passed through the solution to convert any caustic soda into carbonate, and the solution boiled. The result will be an insoluble portion consisting of carbonates of lead and baryta, and of metallic silver. The mixture is filtered, the insoluble residue on the filter is warmed for some time with dilute nitric acid; the solution of nitrates of silver, lead and barium are concentrated on the water-bath nearly to dryness so as to get rid of any excess of acid, and the nitrates dissolved in water. Then the silver is precipitated by hydrochloric acid, the lead by hydrogen sulphide, and the barium by sulphuric acid."

THE CORPUS DELICTI.

The "corpus delicti" may be defined as: The injurious substance; the appreciable cause of injury or death. It is the poison presented in stable condition.

It is not only desirable to so present it, but the law, in some countries, directs that for all cases of forensic chemical research, the poison must be presented to the judge and jury in a permanently stable condition, capable of impressing the senses. This is forensically called the **corpus delicti**.

The following serve to illustrate such: the platinum double-salts of ammonia and alkaloids. Prussian blue from hydrocyanic acid, mercury in the form of red mercuric iodide, oxalic acid in the form of calcium oxalate, spots and mirrors of arsenic and antimony, phosphorus in its natural state, the seeds of various plants such as stramonium, hemlock, and hyoscyamus, the hulls of berries such as belladonna, leaves fragments such as those from digitalis, hyoscyamus, lobelia, root fragments from aconite, the shining, green particles from cantharides, etc.

Questions commonly asked the analyst are: Is the poison combined or free? How was it obtained? Could it exist naturally? How much was found, its strength, and the quantity fatal? If there is no poison, is anything detrimental to health present?

PART VI.

THE SIGNS OF DEATH.

1. Absence of respiratory murmur.
2. Absence of cardiac pulsation.
3. Insensibility and inability to move.
4. Changes in the eyes.
5. Body pallor.
6. Loss of animal heat.
7. Venous coagulation.
8. Rigor mortis.
9. Cadaveric lividity.
10. Putrefaction.
11. Saponification.
12. Mummification.

TESTS.

1. A feather lightly suspended near the mouth or nose remaining unmoved indicates death has occurred.

2. Hold a bright mirror over the mouth and nose of the subject and any respiratory moisture promptly appears upon the glass.

3. The eyes are insensible to light after death, neither dilating nor contracting; but some poisons and some brain affections have similar effects. (Test may be made with candle or lamp).

4. Insensibility of the cornea to touch indicates death, although certain injuries of the brain, etc., produce the same condition.

5. The conjunctivæ exhibit gray, cloudy discolorations, rapidly changing to black, upon their surfaces, due to formation of films of mucus or to cadaveric imbibition from decomposition changes.

6. After death, any external pressure on the eye-

ball permanently alters the circular shape of the pupil.

7. Examine cardiac and pulmonary regions carefully, the former with a stethoscope.

8. Apply a ligature to a finger or limb and note if part beyond the constriction becomes a deep-red or purple color—evidence of life.

9. As a rule, scarifying the surface of the body and then applying a cupping glass causes no blood to flow if death has occurred.

10. Open a vein and see if coagulation of the blood has ensued.

11. Inject ammonia solution subcutaneously; if living, a port-wine congestion will appear in the surrounding parts; if dead, it does not appear.

12. Thrust a clean, bright needle into the biceps muscle and leave it there for a time; it will rapidly rust and tarnish (oxidize) if life is not extinct; if it is, no such change results.

Rigor mortis or cadaveric rigidity—the stiffening of the muscles of the body throughout its entire extent, and probably due to the coagulation of the myosin in the muscles—usually takes place inside of six hours after death. Its duration is from 16 to 24 hours—until putrefaction sets in. Heat shortens and cold prolongs rigor mortis. In sudden accidental death while in health, appearance of rigor mortis is delayed, whereas in death from exhausting disease, as phthisis, it promptly appears. Rigor mortis begins in muscles of the eye, then affects muscles of lower jaw and neck, then chest and upper extremities, and lastly muscles of abdomen and lower extremities.

If body is only slightly cold and jaws show signs of rigidity, with glazed eyes and shrunken eye-balls, death has probably occurred within $\frac{1}{4}$ to 4 hours.

If the whole body is perfectly cold and rigid, death has occurred within 12 hours to 4 days. If cadaveric lividity be present, death has probably occurred in from 1 to 4 days.

PART VII.

SUDDEN DEATH.

CAUSES OF DEATH.

Sudden death may result from:

1. The action of such poisons as aconite, alcohol, carbolic acid, hydrocyanic acid, oxalic acid, anesthetics, cocaine, mercuric cyanide, potassic cyanide, silver cyanide, irrespirable gases, nitrobenzene, nitroglycerine, nicotine, phosphorus, snake venom, strychnine, etc.

2. Violence: such as a blow upon head, or large blood-vessel, over heart or plexus of nerves, etc.

3. Hemorrhage: cerebral, gastric, aortic, etc. Hemorrhage into pancreas; into peritoneal cavity from ectopic gestation, or ruptured uterus, etc.

4. Rupture of internal organs: as heart, spleen, distended bladder, pregnant uterus, or other organ in the abdominal cavity. Rupture of ulcer in some part of alimentary canal. Rupture of vessel, varicose vein or aneurysm, etc.

5. Such cardiac affections as angina pectoris, aortic regurgitation and other valvular diseases when associated with deficient compensation, cardiac degeneration; the exhaustive effects upon the heart of diphtheria and other poisonous diseases, etc.

6. Thrombosis, embolism, bronzed-skin disease, diabetes, uræmia, epilepsy, intense emotion, etc.

7. Such affections of the respiratory system as: asthma, whooping cough, pneumothorax, hemothorax, pleuritic effusion, acute pneumonia, tumors, foreign bodies in pharynx, larynx, or trachea, membranous deposits, spasm or œdema of glottis or larynx, etc.

MODES OF DEATH.

(Partly adapted from Bichat and Herold).

The actual or immediate cause of sudden death is obviously dependent upon one or other of the three

great centres of life, the heart, the lungs, or the brain. When one of these centres ceases to work, the actions of the others are promptly embarrassed, as the maintenance of life is dependent upon the integrity and activity of each.

The modes of death have been classified into:—

- 1—Death beginning at the brain, **coma**.
- 2—Death beginning at the heart, **syncope**.
- 3—Death beginning at the lungs, **asphyxia or apnoea**.

The **immediate** cause of death should be sought in the brain, heart or lungs, no matter what the **remote** cause of the death may be.

COMA.

Coma may be defined as a state of profound insensibility. It is a condition usually dependent upon changed brain conditions.

Causes: May be due to increased amount of blood in blood vessels of brain, to blood or other fluid or solid outside those vessels, or to brain injury. Hence: Compression of the brain; apoplexy; fractures of the bones of the head or other injury to the skull; hydrocephalus; concussion of the brain; the action of narcotics, arsenic, coal gas, or other poisons; various discharges and hemorrhages; certain diseases of the kidneys, such as uræmic poisoning; or of the liver, such as acute yellow atrophy; etc.

Symptoms: Stupor; patient insensible to external impressions; unconsciousness; slow, irregular, stertorous breathing; loss of voluntary control over respiration—as the medulla begins to be affected there is increasingly feeble respiration; pulmonary circulation and aeration of blood ceases; the pulsations of the heart, and lung movements are arrested; the pupils are sluggish and dilation frequently occurs.

Post-Mortem Appearances: More or less blood in the cavities of the heart, but not such an engorgement as when death has resulted from asphyxia.

Usually the brain is congested and there is more or less œdema.

SYNCOPE.

Syncope may be considered to be suspended animation, due to failure in heart action.

Causes: Heart action may have been arrested by either (1) **Anæmia** or (2) **Asthénia**.

1—**Anæmia**, or less blood than normal: due to sudden loss of blood from ruptured aneurism, uterine or pulmonary hemorrhage, and from cardiac or vascular injury; also suppurations which act indirectly as severe drains upon the blood.

2—**Asthénia**, or insufficient heart power: due to paralysis of its muscular walls. This may be the result of fatty degeneration or other cardiac diseases, of starvation, of cancer, cholera, typhoid fever, phthisis, diabetes, dysentery, or other exhausting disease; certain poisons, such as digitalis, prussic acid, veratrum viride, etc.; certain injuries, such as blows over the stomach, concussions of the spine, etc.; also severe cerebral lesions; shock.

Symptoms: 1—**Anæmia**: face pale or dusky; lips livid; skin covered with a cold perspiration; sight dimmed; tinnitus aurium; vertigo; pulse irregular and weak; pupils dilated; gradual insensibility. May be nausea, vomiting, irregular respiration, jactitation, photophobia, convulsions; may be hiccough. The nervous symptoms result from the insufficient supply of blood to the brain.

2—**Asthénia**: arrest of circulation in the extremities, producing lividity of the fingers, lips, nose and ears; surface of body and extremities cold; weak, frequent pulse; although great muscular weakness, the senses and intellect are unimpaired.

Post-Mortem Appearances: 1—**Anæmia**: heart empty and contracted; if death was delayed, may be a heart clot; organs and tissues usually pale.

2—**Asthénia**: heart may contain some blood, but its cavity is more or less dilated or flabby from stoppage of blood in the circulation; the blood is in the large arteries and veins; neither the brain nor lungs are engorged.

ASPHYXIA (Apnœa).

Asphyxia is a condition of more or less complete suspension of respiration. Asphyxia from the inhalation of poisonous gases may be due to a damaging of the red blood-corpuscles, in some cases their oxygen carrying power being almost prohibited by the conversion of their hæmoglobin into methæmoglobin.

Causes: Arrest of respiration resulting from :
1—Mechanical obstruction to the entrance of air into the lungs, as the pressing of foreign bodies in the air passages; a tetanic spasm of the respiratory muscles, produced by strychnine poisoning, tetanus, etc.; pressure of the thorax; muscular exhaustion from cold or debility; paralysis of the pneumogastric or phrenic nerves; submersion; suffocation; hanging; strangulation; absence of air, as in very high altitudes; the effects of sulphuretted hydrogen gas, chlorine gas and other irritant gases. 2—Diseases, such as bronchitis, pneumonia and other lung diseases; spasm or œdema of the glottis; embolism of the pulmonary artery; pharyngeal abscess, and serum blood or pus accumulated in the pleural cavities.

Symptoms: Sense of suffocation, with vigorous effort to breathe; face livid; unconsciousness; vertigo; sphincter muscles relaxed; general convulsions.

Post-Mortem Appearances: The skin and mucous membranes are livid. The lungs may be engorged with dark blood; the bronchi being reddened by both venous engorgement and ecchymoses; they may contain either froth or blood; the pulmonary artery, right cavities of the heart and the venæ cavæ are engorged, and usually the viscera; the left side of the heart, the aorta and the pulmonary veins are comparatively empty; sometimes, however, the cavities of the right side of the heart are empty.

Usually the blood is fluid and dark and may contain a few clots. The veins of the brain are engorged.

Punctate ecchymoses (small dark hemorrhagic points) may be found here and there over surface of brain, lungs or other organs, especially if asphyxia were rapid and were violent attempts at respiration.

PHARMACOLOGICAL TOXICOLOGY

The study of the physiological or ultra-physiological reasons, etc., for the various symptoms which are produced by substances in toxic doses, i.e., the basic *modus operandi*, etc., of the drug, is a most important part of toxicology.

It should be noted that the character and degree of influences exerted by various toxic substances, in relatively proportionate doses, upon man, and upon various animals with similar organs and functions, often differ more or less widely.

Nevertheless, in very many instances, such a degree of parallelism and close relationship exists between the human and animal phenomena produced by various poisonous substances as to command our interest, careful observation and investigation. Furthermore, experience demonstrates that the measures which are successful in neutralizing and combating poisons and their effects in the animal are, as a rule, absolutely identical with those which relieve man.

Hence a careful study of the effects of various poisons upon certain animals, and the measures which are most successful in their treatment, may well furnish information of the highest value in saving human life. All investigations should, however, unquestionably be carried out with no lack of humane considerations.

The animals most suitable for the study and demonstration of the poisonous effects and the proper treatment to be employed in poisoning by various poisons are chiefly the following: Dogs, cats, rabbits, guinea pigs, rats, white rats, mice, monkeys, fowls, pigeons, frogs, turtles and toads. The first four and frogs are most used; as a rule, the best results being obtained by using medium-size dogs. Some poisons have nearly, if not quite, opposite effects upon cats from those which they produce upon dogs; the effects upon dogs being analogous to those upon man. There are other notable differences in animal phenomena, calling for an intimate knowledge of both animal peculiarities and the methods of operation of poisons in such.

Where individuals, or the members of a laboratory group, administer a poison, note the phenomena resulting, and apply suitable remedial measures, the following facts should be carefully recorded: The date, name of the observer or observers, the place, the kind of animal, its color, markings, condition, sex, apparent age, weight, etc. The preliminary measures employed (such as anesthesia, etc.). The name, condition and form of the poison to be employed (its purity; if a solid, liquid or gaseous substance, etc.). The quantity and time of administration of the first and subsequent doses. The effects of each as regards vomiting and excretions, stupor or delirium

or excitement, etc. The position taken by the animal, and if maintained. The muscular action (twitchings and other motions), their regularity or the reverse, frequency, severity, duration, etc. The respirations, their frequency, regularity, force, depth, etc. The pulse, temperature, condition of eyes and mental condition. Additional facts.

Some of the physiological causes of toxic phenomena in man, and the doses to be employed in laboratory demonstrations and investigations upon animals, are given below. Experience teaches that there is a marked individuality regarding the powers of resistance of an animal of a given kind to the effects of a certain poison, as compared with another animal of the same kind which has been given a proportionate dose of the same poison. Allowances for such must be made in computing dosage and in anticipating effects.

Acetanilid. Paralysis of motor and sensory nerves. Depression of heart and vasomotor mechanism, producing immediate fall of arterial blood pressure. Depression of respiratory center, diminished oxygen-carrying power of the blood, and paralysis of peripheral motor nerves. Formation of methemoglobin. Hemolysis may occur. There is loss of heat through vaso-dilatation from the central action.

On frogs it seems to paralyze motor nerve endings. When convulsions occur in animals, such are sometimes of spinal and sometimes of cerebral origin. Doses (toxic). Dog: 0.7 to 0.8 gm. x kilogram by mouth. Rabbit: 0.2 to 0.4 gm. x kg. by mouth.

Anilin. On frog: 2 drops in mouth producing convulsions, cardiac paralysis and death.

Phenacetin. On dog: 0.3 to 0.5 gm. x kg. by mouth toxic and fatal.

Acid, Carbolic. Depression of cerebrum and heart; heart stops in diastole. Arterial tension reduced. Stimulation of center and periphery of vagi. Depression followed by paralysis of respiration from depression of centers. Carbolic acid is absorbed from the stomach particularly when associated with alcohol; and it readily diffuses into the blood, where it probably exists as an alkaline carbolate. Although it is eliminated by all the secretions, such occurs mainly through the lungs and kidneys. In the urine it appears as salts of sulphocarbolic and glycuronic acids, etc., but considerable of the phenol is eliminated without being changed. There is diminished heat production and increased heat dissipation. Fall in blood pressure through paralysis of vasomotor center. In collapse from phenol all the medullary centers and the cardiac muscle are involved, and consequently the collapse cannot be removed by artificial respiration. However, in collapse from drugs of the alcoholic series, the opposite maintains. Dose. Dog: 0.2 to 0.3 gm. x kg. hypoderm., toxic and fatal. Cat: 0.1 to 0.2 gm. x kg. (in solution) hypoderm., toxic and fatal. Rabbit: 0.1 to 0.2 gm.

x kg. hypoderm., toxic; 0.5 to 0.7 gm. x kg. hypoderm., toxic and fatal. Guinea Pig: 0.4 to 0.6 gm. x kg. hypoderm., toxic and fatal. Frog: 1 to 8 mg. (in 5 per cent. solution) hypoderm., toxic and fatal. Anesthetized dog: 50 mg. x kg. in vein, toxic; by stomach 1 to 2 cc. x kg., dilute or concentrated, toxic and fatal.

Acid, Hydrocyanic. There is a primary involvement of the medullary centers, followed by that of other nervous centers. First a stimulation of the respiratory center producing fuller and more rapid respiratory movements. Then convulsive respiratory movements develop, accompanied by dyspnoea, with ultimate paralysis of respiration; falling blood pressure, medullary and cardiac paralysis. Oxygen absorption is prevented, and the failure to reduce the oxyhemoglobin causes the venous blood to retain its bright red color. Dose: 5 to 15 cc. of a 2 per cent. solution is toxic and fatal by mouth. Rabbit, 5 to 10 cc. of the same solution.

Acid, Mineral. By chemical combination with the protoplasm, the tissue is dissolved, i. e., corroded. By coagulation of the myosin, muscular rigidity is produced. In combining with the protoplasm mineral acids neutralize the alkalies and form mineral salts. They combine with the albumin, forming acid albumin. Therefore, their local action is more or less caustic. Dose: hydrochloric acid, toxic and fatal effects. Rabbit, 1 per cent. solution by mouth 1 gm. x kg. Heart action and respiration slowed, paralysis and convulsions followed by death. Guinea pig, 5 to 30 cc.

Acid, Oxalic. Affects central nervous system, especially the medullary centers. The mental functions and reflexes are first stimulated and then paralyzed. Death may be due to either cardiac or respiratory paralysis. Dose: Rabbit, 2 to 4 gm. by mouth, toxic and fatal. Guinea pig, 0.1 gm. hypodermically, toxic and fatal. Frog, 0.05 to 0.1 gm. hypodermically, toxic, may be fatal.

Aconitine. The vasomotor center successively stimulated and depressed, and a very variable blood pressure occurs. The effects upon the heart are the result of direct action upon the heart muscle and also due to a stimulation and depression of the vagus and the accelerator mechanisms. There is increase in the rate of the heart action for a time. The heart becomes very arrhythmic. Finally the medullary centers are paralyzed. Blood pressure is lowered by direct depression of the heart or its motor ganglia. Ultimately the heart is arrested in diastole. Clonic convulsions may result through interference with the cerebral circulation. The sensory neurons of the spinal cord and the sensory filaments of the peripheral nerves are depressed. As aconitine has a sedative effect upon the stomach, toxic doses may not vomit. Dose: Aconitine, rabbit, 1.5 mg. x kg. hypodermically. Guinea pig, 2 mg. x kg. Pigeon, .06 mg. x kg. Frog, 0.2 mg. x kg. hypodermically.

Apomorphine. On central nervous system, first stimulant then paralyzant in its action. The cardiac muscle may be paralyzed, also the respiratory center. Dose: Dog, 2 to 4 mg. x kg. hypoderm. causes emesis by action on medullary center. Rabbit, same dose acts as a cerebral stimulant, causing excitement, but does not vomit. Grain $\frac{1}{250}$ to $\frac{1}{150}$ applied to frog's heart diminishes action and causes paralysis.

Arsenic. There is a fall in blood pressure, chiefly the result of the following: A peripheral vascular paralysis (capillary). Depression of the vasomotor center and diminished cardiac action. A great amount of blood is drawn from the general circulation by the distention of the splanchnic area, thus reacting upon other organs, and a paralysis of the central nervous system may result. There is increased permeability of the capillary walls. In the intestine there is marked exudation into the connective tissue.

Dose. Liquor Potasse Arsenitis (U. S. P.): Dog, 1 cc. x kg. by mouth, toxic and fatal. Rabbit, 1 cc. by mouth, fatal as a rule.

Belladonna (Atropine). Stimulation followed by paralysis of various parts of the central nervous system, particularly of the medullary and cerebral centers. A primary paralysis of certain peripheral nerve endings, as those governing secretion, accommodation, and the action of cardiac and intestinal muscle. Primarily stimulation, subsequently paralysis of smooth and cardiac muscle.

Dose. Atropine Sulphate: Dog, 20 mg. to 0.4 x kg. hypoderm. produces paralysis of vagi and proves fatal as a rule. Cat, 0.05 to 0.08 gm. x kg., paralysis of vagi. Rabbit, 1 to 2 gm. x kg. hypoderm., toxic. Dog (anesthetized), 1 mg. x kg. hypoderm., vagi paralyzed. Rabbit (anesthetized), 10 to 15 mg. x kg. hypoderm., prompt paralysis of vagi. Guinea pig, 0.5 to 0.8 gm. hypoderm., fatal. Frog, 0.1 gm., fatal dose. Solution $\frac{1}{6}$ to $\frac{1}{10}$ per cent. applied to frog's heart causes arrest of mucous secretion and paralysis of vagus.

Chloral. Depression of cortical cells of brain and of spinal cord. Respiratory center depressed, and its function may entirely cease from paralysis. There is an increased destruction of proteids. Chloral produces a destructive influence upon the blood and the blood vessels. Muscular metabolism is diminished through a lessened muscular activity. There is lessened oxidation in the cells of the body, and an increased heat dissipation owing to dilatation of the cutaneous vessels; a diminished heat production and reduction of bodily temperature.

Dose: Dog (anesthetized), 0.5 to 2 gm. x kg. in vein, toxic. Cat, 0.15 gm. x kg. by mouth, toxic and fatal. Frog, 0.1 gm., toxic and fatal.

Chloretone. In true narcotic doses chloretone is more dangerous than chloral, *but is useful as an anesthetic for lab-*

oratory animals, because of not requiring attention even in protracted operations. But when recovery of the animal is desired, as when no post-mortem changes are to be observed, it should not be used. The dog is given 20 mg. x kg. of morphine, and when vomiting has occurred, 0.2 gm. of chloretone per kilogram of animal is introduced into the animal's stomach by means of the stomach tube; the chloretone is previously dissolved in the smallest quantity of alcohol which will dissolve it. Anesthesia occurs in 15 to 30 minutes, and usually continues for several hours. In dogs there is a slow fall of blood pressure from chloretone. In rabbits the fall is rapid.

Among the toxic effects of chloretone are a lowered blood pressure through a depression of the heart and vasomotor center, central vasomotor paralysis and cardiac depression. A great lowering of temperature and diminished consumption of oxygen from the effects produced upon metabolism.

Dose: Rabbit, $\frac{1}{2}$ ounce x kg. of a saturated aqueous solution given per rectum usually is toxic and fatal. 0.2 to 0.3 gm. x kg. dissolved in alcohol and given per rectum, toxic and fatal.

Chloroform. Depression of motor and sensory neurons of spinal cord. Medullary depression resulting in slowed respirations and fall of blood pressure. Vasomotor and cardiac paralysis, and diminished heat production. Probably there is a lessened irritability of the heat-regulating centers. Dose: Dog, cat, etc., 1 to 2 drachms hypodermically into femoral vein has toxic effect and produces rigor. Frog, 0.45 cc. hypodermically, toxic and fatal.

Cocaine. Depression of spinal cord and peripheral nerves, particularly of the sensory nerve filaments and of the sensory columns. Vasomotor paralysis and depression of cardio-inhibitory centers. Marked reduction in arterial pressure. Paralysis of the respiratory center.

Dose: Dog, 15 to 30 mg. x kg. hypoderm., commonly fatal. Rabbit, 60 to 70 mg. x kg. by mouth, toxic; 100 to 500 mg. x kg. hypoderm., usually fatal. Guinea pig, 60 to 70 mg. x kg. hypoderm., toxic and fatal. Frog, 3 mg. fatal. 1 per cent. solution applied to vascular surface causes vaso-constriction and temporary paralysis of nerve trunks.

Conium (Coniine). Paralyzes of both ganglia and motor endings. Action is therefore half-way between that of curare and of nicotine. The central nervous system, particularly the medullary centers, depressed, and the symptoms which occur are referable chiefly to the motor system. An ascending paralysis ensues; it is probably due to a reduced conductivity of the cord to impulses coming from the brain. The first interference being a blocking of the path, to those impulses which have the greatest distance to travel. The ascending paralysis gradually proceeds from the lower extremities to the tongue; thus speech may be lost while the brain is still active and the mind clear. The historic symptoms of Socrates,

after drinking the fatal cup of hemlock, well exemplify the leading features of an ascending paralysis thus induced.

Dose: Dog, 0.2 to 0.4 gm. x kg. hypoderm., toxic. Cat, 0.05 to 0.4 gm. hypoderm., toxic and fatal. Rabbit, 80 to 100 mg. x kg., toxic and fatal. Guinea pig, 0.5 x kg. hypoderm., toxic and fatal. Frog, 0.06 gm. x gm. hypoderm., toxic and fatal.

Convallaria. Action similar to that of Digitalis. Dose: Guinea pig, 0.04 to 0.1 gm. x kg. hypoderm., toxic and fatal. Frog, 0.26 to 0.30 mg. x gm., toxic and fatal.

Curare. Paralysis of ends of motor nerves distributed to respiratory muscles. Central paralysis may result. End plates of motor nerves of striated muscles are paralyzed, the respiratory and smaller muscles being affected first. Unstriated muscle terminations and sensory nerves are unaffected. There is a paralysis of the peripheral ganglia sympathetic. There is a reduction in blood pressure and a diminished general metabolism. Although in warm-blooded animals death results from a paralysis of the respiratory muscles, nevertheless, if the dose has been barely large enough to produce a respiratory paralysis, recovery may occur if artificial respiration be maintained. In cold-blooded animals where the respiratory exchange occurs chiefly through the skin, respiratory movements not being necessary, elimination of the poison gradually takes place if the animal be kept in a moist atmosphere so as to favor such action. Direct application of curare to the spinal cord causes the typical convulsions of strychnine poisoning; as ordinarily administered such effects are masked by the paralysis of the nerve endings. Sometimes, however, typical strychnine convulsions appear before the development of the typical curare action. Dose: Frog, $\frac{1}{4}$ to 3 cc. of a 1 per cent. solution of curare, introduced into dorsal lymph sac of frog, toxic, paralyzant.

Digitalis (Digitalin, Digitoxin). Vagus center partially paralyzed, or may be intense irritability of cardiac muscle, resulting in delirium cordis. An arrhythmia; inefficient cardiac contractions and cardiac exhaustion with relaxation in diastole. The blood pressure is irregular and ultimately it is greatly lowered. Inasmuch as absorption of digitalis occurs more rapidly than its elimination, it has an accumulative effect when given at about the limit dosage or over a protracted period in large doses. Dose: Dog (anesthetized), 1 to 5 mg. x kg. hypoderm., toxic. Frog, 3 to 5 mg. hypoderm., toxic and fatal.

Ether. Over-stimulation and paralysis of respiratory center. Great reduction in temperature from depression of circulation and respiration, and rapid evaporation of the ether, by which body and lungs are chilled. The nervous mechanism governing the heat centers appears not to participate in this effect. Dose: Dog (anesthetized), 8 to 15 cc. hypoderm., toxic. Frog, 6 to 8 cc. hypoderm., toxic and fatal.

Formaldehyde. Large doses injected into the blood cause

coagulation, producing methemoglobin and hematin. Dose: Rabbit, 0.25 to 0.5 gm. x kg. hypoderm., toxic and fatal.

Gelsemium (Gelsemine). Depression of heart and of spinal cord, especially of its motor neurons. The peripheral filaments of the cranial nerves are paralyzed, also gradually the respiratory center. Its mydriatic action appears to be due to a paralysis of the motor oculi nerve. Dose: Guinea pig, 2 to 6 gm. x kg. hypoderm., toxic and fatal. Frog, 7 to 15 mg. x gm. hypoderm., toxic and fatal. Local application to heart of 2 per cent. solution causes paralysis.

Hyoscyamus (Hyoscyamine). Action similar to Belladonna. Dose: Guinea pig, 10 gm. x kg. hypoderm., toxic and fatal. Frog, 10 to 15 mg. x gm., toxic and fatal. Hyoscyamine: Cat, 0.03 to 0.06 mg. hypoderm. causes paralysis of vagi. Frog, 5 to 10 mg. hypoderm., toxic and fatal.

Iodine (Iodides). Employed internally, rapid absorption occurs in the form of iodides, and promptly appears in all of the body secretions. Most of it is removed in the urine in the form of iodides. Iodides in the blood are supposed to be converted into sodium iodide without affecting the composition of the blood. It is supposed that they form a loose combination with proteids. It is asserted that potassium iodide dilates the blood vessels, thus increasing the secretion of glands. Dose: Dog (anesthetized), tincture of iodine 4 cc. hypoderm., toxic. Rabbit (anesthetized), 0.1 to 1.0 gm. x kg. hypoderm., toxic and fatal.

Ipecac (Emetine). Reduction of temperature by poisonous doses. In dogs very large doses produce cardiac paralysis, especially if injected into the jugular vein. Dose: Dog, emetine, 1 to 2 mg. x kg. hypoderm., emetic. Dog, cat, rabbit, 0.1 to 0.2 gm. x kg. hypoderm. or 0.02 to 0.05 gm. x kg. injected into femoral vein is promptly toxic; fatal. Frog, 5 to 10 mg. hypoderm., toxic, paralysis, fatal.

Mercury (Corrosive Sublimate). The soluble salts of mercury to some extent inhibit the digestive properties. The insoluble salts are somewhat irritating and produce increased peristalsis and secretions. They act but slightly upon the digestive ferments. Leukocytosis, etc., may be produced by large doses. Dose: Dog corrosive sublimate, 1 to 2 ounces of one per cent. solution by mouth toxic, producing more or less corrosion of alimentary canal. In rabbit same dosage fatal, with alimentary canal corrosion.

Methylene Blue. There is a strong affinity between the axis cylinders of nerves and methylene blue. Dose: Dog (anesthetized), 0.1 to 0.2 gm. in solution into femoral vein, toxic and fatal.

Muscarine. Stimulates the cardiac endings, which are paralyzed by atropine. Contractility of skeletal muscles is diminished. Fall of blood pressure. Vasomotor paralysis. Dose: Dog, $\frac{1}{2}$ to 3 mg., toxic; 1 mg. hypoderm, produces toxic ef-

fects; 3 to 12 mg., toxic and fatal effects. Frog, 5 to 7 mg. hypoderm. paralyzes vagi and fatal.

Opium (Morphine). Stimulates vagi both centrally and peripherally and slightly stimulates the heart or the ganglia which it contains. Paralysis of vagi and heart with resultant rapid, feeble pulse finally occurs. It is supposed that opium depresses both the cerebral perceptive centers and the afferent paths in the spinal cord. Morphine locally employed directly depresses the sensory nerve filaments. It is a powerful respiratory depressant even to the point of paralysis. Peristalsis is stimulated in toxic doses, the inhibitory nerves being paralyzed. The pupils are contracted through stimulation of the motor oculi centers. Dryness of mouth and thirst result from the checking of the secretions of the salivary glands by it. All of the bodily secretions, except that of perspiration, are lessened. Over-stimulation, and consequent exhaustion of the vasomotor center and vagi, produces a rapid and weak pulse. Lactic acid forms in the blood through defective oxidation. Dose. Morphine sulphate: Dog, 5 to 7 mg. x kg. hypodermic produces vomiting; 0.3 to 1.0 gm. injected into femoral vein of medium-sized dog is toxic. Cat, 40 mg. x kg. produces excitement. Rabbit, 0.15 to 0.3 gm. x kg. hypodermic is toxic and fatal; 0.5 to 1.0 gm. x kg. by mouth is narcotic, toxic and fatal, as a rule. Guinea pig, 0.5 to 0.7 gm. x kg., toxic and fatal. Frog, 0.05 to 0.08 gm. in posterior lymph sac, toxic, may be tetanus, and fatal. (Thebaine, one of the alkaloids of opium, belongs to the strychnine group of motor excitants, acting largely upon the spinal cord, causing an increase in the activity of its reflex functions.)

Nux Vomica (Strychnine). Augmented susceptibility to external stimulation, the slightest external stimulus producing a greatly exaggerated reflex. Spasmodic and distressing muscular contraction, chiefly affecting the extensors. Opisthotonos. Toxic doses of strychnine ultimately produce paralysis of the motor apparatus, with loss of voluntary movement, the result of over-stimulation of the reflex centers in the spinal cord, causing exhaustion of the same. The pulse is slowed and weakened, due to an over-stimulation of the motor mechanism and of the heart muscle itself. Blood pressure is increased and the visceral vessels constricted. Asphyxia may occur through interruption of breathing from the tetanic contractions of the respiratory muscles; these muscles finally become exhausted and death occurs from the excessive tetanic contraction and asphyxiated condition or from paralysis of the respiratory center. Respiration may cease some time before the heart stops. Dose. Strychnine Sulphate: Dog, cat, 0.75 to 1.0 mg. x kg. hypodermic, toxic and fatal. Dog, 2 to 4 mg. x kg. by mouth, toxic and fatal. Rabbit, 4 to 5 mg. x kg. by mouth, toxic, may be fatal; 0.58 to 0.6 mg. x kg. hypoderm., toxic and fatal. Guinea pig, 4.5 to 5.0 mg. x kg., toxic and

fatal. Tetanus convulsions may be produced by much smaller doses. Note, in convulsions in frog legs are extended and arms flexed. Is possible to hold frog in horizontal position by the feet. Convulsions commonly intermit, frog paralyzed between spasms. Spasms start with cry.

Paraldehyd. Cardiac exhaustion and lowered arterial pressure. Depression of respiratory center and finally paralysis. Dose: Dog, etc., 1 to 2 gm. x kg. anesthetic. Rabbit, 3 to 5 gm. x kg. by mouth paralyzes vasomotors.

Phosphorus. Cardiac depression. Kidney epithelium irritated. Fatty degeneration of retinal capillaries. It is believed that a portion of the phosphorus is oxidized in the stomach. Then the phosphoric acid which is formed combines with the alkalies and enters the blood in the form of phosphates. Some of the phosphorus appears to be dissolved in the oils and fats which are contained in the stomach and probably passes into the circulation in the form of elementary phosphorus. Dose: Dog, 20 to 30 mg. x kg. by mouth (in oil or mucilage), toxic and usually fatal.

Physostigma (Physostigmine). Powerful stimulation of intestinal contractions. Depression of medulla and spinal cord. Abolished spinal reflexes, finally paralysis of medullary centers. It causes fibrillary twitchings from its action upon muscle substance. The fibrillary twitchings of aconite poisoning are due to its action on motor endings. Dose. Physostigmine Salicylate: Dog, 4 to 6 mg. x kg. hypoderm., toxic and fatal. Cat and rabbit, 2 to 4 mg. x kg. hypoderm., toxic and fatal. Guinea pig, 4 to 6 mg. x kg. hypoderm., toxic and fatal. Frog, 0.5 to 0.8 mg. hypodermic, toxic and fatal. Dog (anesthetized), 0.5 to 3 mg. x kg. hypoderm. removes effect of curare.

Picrotoxin. Acts chiefly on medulla. Clonic convulsions, increased respirations. Slowed heart and pulse, rise in arterial pressure. Increased reflex irritability of spinal cord. Vasomotor center stimulated. Depression of cardiac muscle. Finally all stimulant action gives way to paralysis. Medullary centers paralyzed. In the *frog* spasms of the laryngeal muscles result in distention of the body with air and a characteristic cry quite like that frequently heard in poisoning of a frog with strychnine. The convulsions are cyclic and occur, as a rule, only after a period of depression. Between the convulsive periods the frog often appears to be paralyzed. Since in convulsions the action may be located in the sensory nerve endings, in the brain, the medulla, the spinal cord, the motor endings, or even the muscle fibers, it is interesting to locate such action in using the various convulsants. Motor stimulation may be central or peripheral. When central it is abolished by progressive destruction of the central nervous system, and its exact location thus noted. In poisoning of a frog by picrotoxin it is seen to be located in the medulla; by strychnine in the spinal cord; by atropine and cocaine in the cere-

brum itself. Peripheral motor stimulation, not abolished by nerve section upon test, but abolished by curare, hence in the motor endings, as by aconitine and nicotine poisoning; not abolished by nerve section or by curare, hence in the muscle fibers, as in poisoning by caffeine, physostigmine, and veratrine. In picrotoxin, emprosthotonos and may be "bucking." Convulsive action chiefly on flexor muscles. Dose: Dog, 10 to 15 mg. x kg. hypoderm., toxic; convulsions, paralysis, death; 0.06 to 0.1 gm. x kg. by mouth, toxic and fatal. Cat, 1 to 2 mg. x kg. hypoderm., toxic. Guinea pig, 5 to 10 mg. x kg. hypoderm., toxic; 10 to 15 mg. x kg. hypoderm., fatal. Frog, 5 to 8 mg. hypoderm., convulsant; 10 to 15 mg. hypoderm., fatal.

Pilocarpine. Primary stimulation is followed by depression of the nerve endings, the ganglia and cells. There is depression of the respiratory center, and vasomotor paralysis. Motor centers, especially of the cord, are paralyzed (atropine is a physiologic antidote). Finally a marked paralysis of various parts of the central nervous system. Late there is a paralysis of the motor oculi endings. When pilocarpine is applied to the heart of a frog it produces stimulation, then paralysis. It appears to be a direct paralysis of the heart muscle. Dose. Pilocarpine Hydrochloride: Dog, rabbit, etc., 5 to 8 mg. x kg. hypoderm. causes free salivation. Rabbit, 0.4 to 0.5 gm. hypoderm. x kg., toxic. Guinea pig, 0.04 to 0.05 gm. x kg., toxic and fatal. Frog, 0.05 to 0.1 gm., toxic and fatal.

Potassium Permanganate. Gives up a part of its oxygen when it comes in contact with organic matter.

Silver Nitrate. Precipitates the albumin of the cells with which it comes in contact, and contracts the blood vessels. In its concentrated state a caustic, coating the parts affected with a silver albuminate; but its corrosive effects are superficial, owing to the impenetrable character of the coagulum, promptly formed. Therefore its astringent action is exerted mainly upon the gastric mucous membrane, when it is swallowed. Only a very small proportion of that swallowed enters the circulation. Dose: Characteristic effects may be obtained with 10 to 20 per cent. solutions, under anesthesia, or by weaker, otherwise.

Strophanthus. Much resembles digitalis in its action, but differs in some respects. In concentrated form it acts as a muscle-poison, producing paralysis and a tonic contraction of the fibers. It is eliminated about as rapidly as it is absorbed, consequently has little or no cumulative effects. Dose: Rabbit, 0.1 to 0.2 gm. hypoderm., toxic and fatal. Guinea pig, 7 to 10 mg. x kg., toxic and fatal. Frog, 0.01 to 0.03 mg. x gm., toxic and fatal. Dog (anesthetized), 0.05 to 0.15 gm. x kg., toxic, fatal.

Tobacco (Nicotine). The peripheral effects of nicotine are quite similar to those of pilocarpine, except that the action is confined to the ganglia, and paralysis promptly follows stim-

ulation. The nicotine effects may be removed by atropine or muscarine. Nicotine convulsions are not entirely located in the spinal cord, but also in the medulla and hind brain. Stimulation of the central and ganglionic vagus slows the heart, but subsequent paralysis of the vagus ganglia suddenly greatly quickens it. Increasing depression of the vasomotor ganglia dilates the blood vessel and reduces the blood pressure. Finally reduced coronary pressure wears out the heart muscle. After short stimulation effect, nicotine paralyzes the ganglia in relation to unstriated muscle. (Curare acts chiefly upon end plates, nicotine upon ganglia.) Upon frogs nicotine causes, in toxic doses, first an extension of the forearms, finally also of the hind legs. Dose: Dog and rabbit, a few drops of the alkaloid dropped upon the tongue of the animal usually causes convulsions. Dog, 0.05 to 0.2 gm. hypoderm., toxic and fatal, as a rule. Rabbit, 20 to 30 mg. x kg., toxic and usually fatal. Guinea pig, 30 to 50 mg. x kg. hypoderm., toxic and fatal. Frog, 2 to 4 mg. hypoderm., toxic and usually fatal. Dog or cat (anesthetized), 2 to 12 mg. x kg. hypoderm., toxic effects; vagus stimulated, then paralysis, paralysis ganglia.

Veratrine. Causes striated muscles to respond intensely to stimuli and there is a great prolongation of the period of contraction. Ultimately the muscles become paralyzed. Depression of medullary centers and heart. Convulsions result from stimulation of spinal cord centers. In many respects veratrine acts like aconite. It finally depresses the central nervous system more or less generally. In rabbits one of its common toxic effects is to make the animal "buck." It is corrosive. Frequently causes dizziness and blindness from its superior central action. Dose. Veratrine Sulphate: Rabbit, 2 to 3 mg. x kg. hypoderm. causes convulsions; 1 cc. of 1 per cent. solution by mouth causes corrosion of stomach. Rabbit (anesthetized), 8 to 10 mg. hypoderm. paralyzes heart. Frog, 1 mg. hypoderm., toxic and fatal, as a rule; $\frac{1}{2}$ per cent. solution applied to frog's heart stops it in systole.

THE PRODUCTION OF ANTI-TOXINES FROM MINERAL AND VEGETABLE POISONS.

It is possible that the common mineral and vegetable poisons, such as arsenic, lead, mercury, atropine, morphine, etc., may cause the formation of antitoxines, as do the organisms of diphtheria, tetanus, etc., when administered for such purpose. Hirschlaff claims to have been successful in producing an anti-toxic serum capable of counteracting poisoning by morphine. He injected gradually increasing doses of morphine into rabbits and then administered, to other rabbits, some of the thus prepared serum, along with fatal doses of morphine. He claims to have found that much larger doses of morphine could be administered

without fatal effects, when associated with such serum than without the latter. Also that the same serum was similarly protective to mice. He furthermore claims to have demonstrated that the antitoxic-rabbit's-serum is beneficial in acute morphine poisoning of the human ; and that in cases of the morphine habit, it enables the victim to promptly discontinue the drug without experiencing the distressing nervous symptoms commonly encountered. However, this and other sera of similar character, such as an alcoholic-serum, etc., have as yet not been so satisfactorily demonstrated as to be accepted by the scientific world. Further demonstration is necessary for acceptance.



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PART IX.

GUIDE TO POST-MORTEM PROCEDURE.

(In Suspected Poisoning.)

In cases of suspected *poisoning*, the following practical directions are given by Professor Reese, to be observed by those who have charge of *post-mortem* examinations:—

1. Ascertain whether the individual has labored under any previous illness; and how long a time had elapsed between the first suspicious symptoms and his death; also, the time that had elapsed after death before the inspection is made.

2. Note all the circumstances leading to a suspicion of murder or suicide—such as the position and general appearance of the body, and the presence of bottles or papers containing poison about his person, or in the room.

3. Collect any vomited matters, especially those *first* ejected, and preserve them in a clean glass jar, carefully stoppered and labelled. The vessel in which the vomited matters have been contained should be carefully inspected for any *solid* (mineral) matters which may have sunk to the bottom, or adhered to the sides. If no vomited matters be procurable, and vomiting has taken place on the dress, bed-clothes, furniture, etc., then portions of these must be carefully preserved for future examination.

4. Before removing the stomach, apply *two* ligatures beyond each extremity, dividing between each pair, so as to prevent the loss of any of the contents.

5. If the stomach be opened for inspection, this should be performed in a perfectly clean dish, and the contents collected carefully in a graduated vessel, so as to properly estimate their quantity. [Note here, also, the presence of blood, mucus, bile, or undigested food.] These contents should be preserved in a perfectly clean glass jar, securely stoppered, covered over with

bladder and sealed. The contents of the *duodenum* should be collected and preserved separately.

6. Carefully inspect the state of the *throat*, *æso-phagus*, and *wind-pipe* for the presence of foreign substances, and for marks of inflammation or corrosion.

7. Observe the condition of the *large intestine*—especially the *rectum*; the presence of hardened *fæces* would indicate that purging had not very recently taken place.

8. Note any morbid changes in the *lungs*, as congestion, inflammation or effusion; in the *heart*, as contraction, flaccidity, presence of a clot; and the condition of the contained blood.

9. Examine the state of the *brain* and *spinal marrow*, and, in the female, the condition of the uterus, ovaries, and genital organs. (Poisons have sometimes been introduced into the vagina.)

10. Along with the contents of the stomach and duodenum, the viscera that are to be reserved for chemical analysis are the stomach and duodenum (to be kept separate from the others), the liver and gall-bladder, spleen, kidney, rectum, and urinary bladder with its contents. Sometimes, also, a portion of the *blood* may be required for the examination.

11. As the legal authorities will rigorously insist upon the proof of the *identity* of the matters alleged to be poisonous, it is of the greatest importance to preserve such matters from all possible contamination by incautious contact with calico or paper for wrapping up the specimens. When once the suspected articles are deposited in the hands of a medical man, he must preserve them strictly under lock and key, and confide them only to a trusty agent for transportation. Many cases are on record where the chemical evidence failed simply from a want of power clearly to establish the *identity* of the matters analyzed.

Actual testing for poisons in cases of suspected criminality ought to be undertaken only by those whose chemical knowledge and skill are considerable.

A post mortem examination should be made in regular and generally established routine, that it may be orderly, etc. The presence of other medical men and of an assistant to make notes may be of subsequent importance. The report on the autopsy should be clear, accurate, concise, and without expression of personal opinion. The report on the analysis should be comprehensive and as far as possible conclusive.

POST MORTEM APPEARANCES IN POISONING.

THE MINERAL ACIDS (IN GENERAL).

The presence or absence of rigor mortis may be of considerable importance in determining probable time of death in a case of poisoning. Bichat declares he never found rigor mortis in death from charcoal asphyxiation. Brouardel declares he always found it. It may be said in a general way that rigor mortis first makes its appearance from the third to the sixth hour after death. But after poisoning by a large dose of strychnine, rigor mortis immediately succeeds the muscular contraction, if such exists at time of death.

Appearance of body may be healthy. As a rule there are stains about the mouth, fingers and other places with which the acid has come in contact. Mouth cavity and esophagus are usually white and corroded at first but become dark brown and shriveled; mucous membrane detachable. Epiglottis and glottis swollen. The stomach is sometimes contracted, sometimes distended with gas; contains a thick, dark-brown fluid. Outer surface of stomach and intestines is very vascular and that of the stomach may be corroded or perforated. Inner surface of stomach may appear charred and the mucous membrane between the rugae present a scarlet hue. In poisoning by the acids the lining membrane of the esophagus is usually wrinkled or furrowed longitudinally and the mucous membrane of the stomach raised in discolored ridges. The pylorus is usually contracted. The appearance of the inner surface of the small intestines is similar to that of the stomach, if the patient has lived long enough, but is less in degree. Perforation, if it occurs, usually takes place posteriorly if before or after death the person lay on the back, and the edges of the rent are found to be softened. The peritoneum may be greatly inflamed from the escape of the stomach contents through the perforation into

the abdominal cavity. The bodies of persons dead from poisoning by mineral acid seem, for some time, to resist putrefaction.

MINERAL ACIDS.

(In detail).

ACID HYDROCHLORIC.

No stains on lips or face. Usually mucous membrane of mouth, esophagus, etc., are white or whitish-brown, blackened or charred. Ridges on inside of stomach. Glottis and larynx may be injected and corroded.

Hydrochloric Acid poisoning has not been found to result in perforation.

ACID NITRIC.

Discoloration of lips, tongue and inside of the mouth. Mouth and spots on skin where acid has been in contact appear yellow, which is intensified by a solution of caustic potash which would discharge Bromine or Iodine stains. Mucous membrane of digestive tract eroded and softened, but stomach rarely perforated although softened; it may be shreddy. The color appearance of the stomach varies—it may be yellow, due to the action of the acid upon the mucous membrane; black from action of acid on the blood; green or brown from action of acid on the bile. Bladder usually is empty. Blood dark and thick. Lining membrane of esophagus may be divided into minute squares by longitudinal and transverse furrows. Seldom that action of acid is well marked beyond the duodenum.

ACID SULPHURIC.

Post mortem appearances differ in stomach and internal organs according to whether death is rapid or slow, whether the patient dies from acute poisoning, or lives some time and dies from ulceration and

contraction of some part of the alimentary canal. Usual appearances are: larynx, trachea and lungs softened and blackened; esophagus grayish or blackish, softened, and mucous membrane may be separated and peel off. Stomach usually is greatly inflamed in patches or generally, crossed by black lines, and softened or perforated; often contracted and collapsed; black corrugated mucous membrane which may be partly stripped off with underneath surface intensely red; contents may be blackish, pulpy and tar-like, from altered blood; contents of blood vessels black and hard; if there has been perforation, the edges of the opening appear dark and ragged, and the adjoining viscera is blackened and softened. If death was not immediate, may be evidences of inflammation of intestines, peritoneum, etc. In rapid cases extensive coagulation of epithelium in the convoluted and straight urinary tubes; the kidney parenchyma is destroyed but there is absence of inflammation. If acid entered the air passages they will present evidences of corrosive action. Skin of face or surrounding parts touched by acid will generally be corroded and as if covered with white paint, browned or blackened. (But if the poison was taken from a spoon or the neck of a bottle, the mouth may show no signs.)

VEGETABLE ACIDS, CARBOLIC ACID, ETC.

ACID ACETIC.

The mucous membrane of the stomach is not corroded nor softened but is blackish near the pylorus. Coagulated blood in submucous areolar tissue of stomach, interspersed with black elevations. Tongue and esophagus a dirty brown color.

ACID CARBOLIC.

The odor of the acid can be perceived in the body after death. When Carbolic Acid is introduced by

subcutaneous injection or by outward application there are no characteristic post mortem appearances; but when by mouth, grayish white, or when dry, brownish, leathery, wrinkled spots may be found on the cheeks or lips; the mouth, throat, esophagus and stomach often are whitened and sodden and their mucous membrane may be readily detached. If the acid was concentrated, the surface may be eroded. There is reddening (inflammation) between the folds of the stomach. Sometimes the stomach is thickened, contracted and blanched; often greatly congested, and the mucous membrane detached or destroyed. Stomach eschars usually longitudinal, white or gray, involving crests of the folds. Wall of stomach has leathery feel. The duodenum, further portions of intestines, liver and spleen may be affected. Respiratory passages often inflamed and lungs usually filled with blood. Left ventricle of the heart is contracted; right ventricle is distended. The blood is fluid and dark colored. Usually, bladder is empty. The brain sometimes is congested, fluid being found in the ventricles. Blood vessels of liver, kidneys and spleen are gorged with blood. Death resulting from sudden nervous shock, caused by taking a large quantity of the acid, would of course present different post mortem appearances from the foregoing.

ACID HYDROCYANIC.

There are no constant or characteristic lesions. The stomach may be normal or congested. A general venous congestion is the most common sign. It may be said in a general way that with the exception of the changes which may be found in the **stomach** after doses of **Potassium Cyanide** the pathological changes produced by Hydrocyanic Acid and Potassium Cyanide are very similar to those produced by suffocation. The most noticeable fact about the body is the presence of bright-red spots or patches on the **surface** of it, due to the

formation of cyanmethæ-moglobin. The lungs and right heart are full of blood and the pulmonic block produces a backward engorgement. If death be rapid, the left side of the heart is usually empty and strongly contracted; but if death be slow, left side is full of either black and fluid or of coagulated blood. The arterial system is empty. The liver and kidneys, vessels of head and veins of the neck usually are congested. The lungs are gorged and frequently portions of them are oedematous and there is a bloody foam in the mucous membrane of the bronchial tubes. The pleura and other serous membranes are ecchymotic. As a rule an odor of Hydrocyanic Acid exists everywhere, unless concealed by putrefaction, by tobacco, onions, or a strong smelling ethereal oil. The odor of Hydrocyanic Acid may be noticed in the stomach or other parts of the body in some cases, or it may be absent in the stomach and present in other parts of the body. Sometimes the bile is found to be of a deep blue color and the blood black, fluid, or coagulated, and the odor of Hydrocyanic Acid easily recognized. There may be turgescence of the vessels of the brain and an effusion into the ventricles. Casper and Blyth recommend that the head be first opened and examined to perceive the odor in the brain, where, if present, it may longer be detected than in the abdominal and chest cavities, owing to the earlier putrefactive changes in the latter. No inflammatory change in the stomach mucous membrane would be expected in poisoning by **Bitter Almonds**, yet eroded, inflamed patch found in one case.

Cherry Laurel Water.

The stomach is very red. One case showed intense congestion everywhere.

ACID OXALIC.

The mucous membrane of the mouth, pharynx and esophagus is usually soft or brittle, white, shriv-

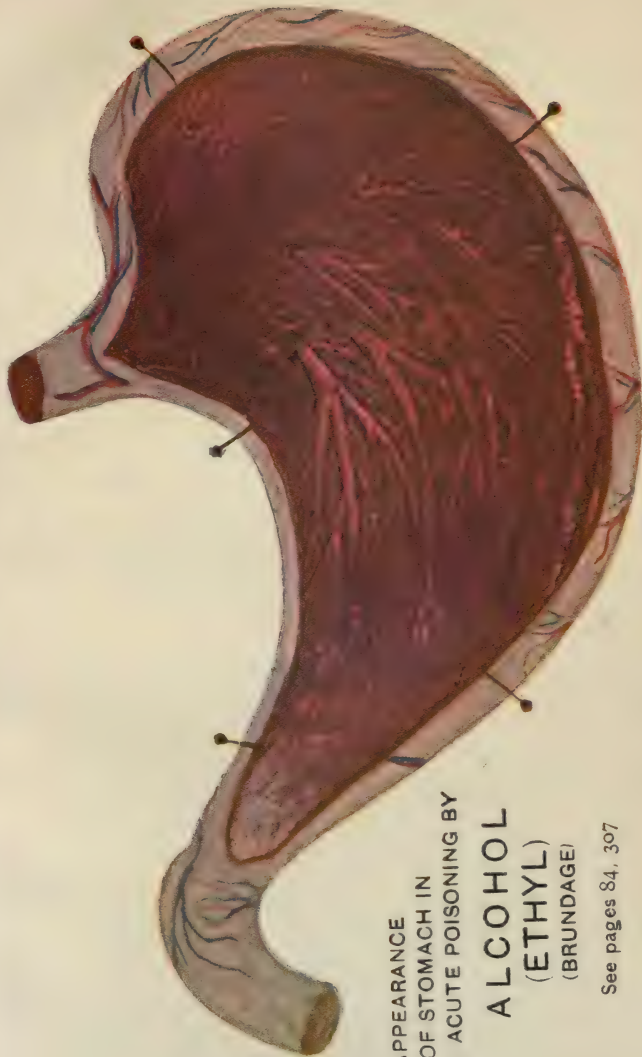
eled and easily removed. The surface of the esophagus may appear brown and raised in longitudinal folds. The stomach is frequently contracted, containing a highly acid, brown, jelly-like liquid, mainly consisting of altered blood; if death be rapid, the mucous membrane may be soft and pale, but if delayed is usually black in some parts of it and in other parts greatly congested, in rugae, with some portions peeling off in patches and the underneath coats gangrenous. Actual corrosion and perforation is however rare, although the stomach may be too softened to remove entire. The intestines are usually much congested and contracted more or less throughout their whole extent if death was not prompt. The blood is fluid in all parts of the body, except the esophagus and stomach. As a rule the lungs are congested. Occasionally the brain is found to be congested. The kidneys are usually dark and full of blood; may show a fine striping corresponding to the canaliculi; the whole boundary layer may be colored white, due to a deposition of Calcium Oxalate. The urine is albuminous and contains hyaline casts and deposits of oxalates. Sometimes there are no abnormal post mortem appearances.

ACID OXALATE OF POTASH.

The pathological changes by the Acid Oxalate of Potash are identical with those of Oxalic Acid in both the esophagus and stomach. These parts are almost always more or less inflamed or corroded, and the inflammation may have extended into the intestines. As a rule the stomach while not actually eroded is unnaturally transparent.

ACID TARTARIC.

Intense inflammation of the stomach and intestines.



APPEARANCE
OF STOMACH IN
ACUTE POISONING BY

ALCOHOL
(ETHYL)
(BRUNDAGE)

See pages 84, 307

ACONITE AND ACONITINE.

No characteristic lesions. May be more or less congestion of lungs and liver and general venous congestion. The brain and its membranes frequently are injected and the stomach and intestines reddened; there is more or less dark and fluid blood in the right side of the heart. The blood is as a rule fluid. There is a fullness of the large veins. Sometimes the body is of a marble-like paleness.

ALCOHOL. (See colored Plate.)

Remarkably good preservation and persistent rigidity of the body, as a rule. The mucous membrane of the stomach may be fiery red with patches of a deeper hue; it may be bright red, dark red, brown or pale, but often it is deeply congested and has the odor of alcohol; gastric vessels injected and may present form of a tree with branches—an *arbor mortis*. Lungs, brain, cerebral vessels and membranes, right side of heart, and the great veins of the neck are more or less congested. The pia full of blood, engorgement of sinuses and plexus. Serum is often found in the ventricles. The blood usually is dark and fluid. The great veins of the abdomen are full of blood and in prolonged coma the bladder is distended with urine. Sometimes there are burn-like blebs on the extremities. As a rule the pupils are dilated. The right side of the heart is empty.

ANTIMONY — TARTAR EMETIC.

Usually signs of inflammation of mucous membrane of stomach and intestines, sometimes extending to esophagus and throat. Ulcers and pustules have been found upon the mucous membrane of the mouth. Stomach and intestines usually coated with mucus and signs of inflammation may be absent. The blood is thinner than usual. The brain is, as a rule, congested, and the viscera may be engorged with blood. Lungs generally exhibit signs of emphysema and there may be effusions into the pleura.

ARSENIC.

As a rule the body is remarkably well preserved, putrefaction being most delayed in those organs which contain Arsenic. The antiseptic properties of Arsenic permit of the recognition of the inflammatory changes several months after death. But **putrefactive** changes may produce quite similar redness in a healthy stomach. In acute Arsenic poisoning with diarrhœa, the blood may be thickened and all the organs will present a very dry appearance. In the narcotic form of poisoning the vessels of the brain are usually very plain. The characteristic lesions usually found in Arsenical poisoning are inflammation of the stomach and intestines and a fatty degeneration of the heart, liver and kidneys, with infiltration of the epithelial cells. In acute cases the stomach is most affected. In chronic cases the whole alimentary canal presents an inflamed and ulcerated appearance, particularly the duodenum and rectum. Sometimes the tongue is greatly swollen.

The Stomach: The stomach may be empty or it may contain blood mixed with mucus. It may be contracted and the inner lining corrugated, or the whole interior may show streaks of severe congestion or be of a light-red or brownish color. Sometimes the congested patches are thickened: they may be covered with a false membrane mixed with particles of Arsenic. It is common to find an extravasation of blood into the mucosa. Although the poison be absorbed by the skin or otherwise, there are usually evidences of acute gastritis. Frequently there are thick, pasty, whitish-gray, or green (from Paris Green) patches, usually surrounded by brightly injected membrane, where particles of solid Arsenic adhere to the walls of the stomach; yellowish streaks from formation of Arsenic Sulphide. Hemorrhagic spots may be eroded by gastric contents. The stomach may appear white externally but show a softened and ulcerated condition internally.

The Intestines: Usually similar but less severe

inflammation in this part of the alimentary canal. Congestion and inflammation of the whole intestines may be present. Unless the patient has lived for some days after taking the poison, the large intestine is usually unaffected. Sometimes Peyer's patches, the solitary lymph nodules, and the mesenteric nodes are found to be swollen.

The Tongue, Pharynx and Esophagus: They may be more or less inflamed. The esophagus streaked in dull or bright red patches or even corroded.

The Heart: If death is sudden the heart is usually unchanged; if otherwise, shows evidences of fatty degeneration. The walls of the heart are pale, yellowish, and unnaturally yielding. Ecchymosis of muscular tissue under the endocardium and usually on the left ventricle, the posterior walls or the intra-ventricular septum of the heart.

The Liver: It may be enlarged, as is usual after sudden death. Sometimes marked symptoms of fatty degeneration. In subacute cases fatal results are as much due to inflammation of liver and kidneys as to the poisonous effects produced in the stomach.

The Kidneys: Enlarged, soft, and pale. Upon section, microscope shows a general or streaked yellowish-gray color and a thickened cortex.

BELLADONNA AND ATROPINE.

Usually no very characteristic appearances. The eyes dilated and brilliant and the cerebral vessels and lungs congested, are the chief points. Tongue may be red and mucous membrane of stomach and small intestines injected. If Belladonna berries were eaten, the mucous membrane of the tongue may be purplish. Sometimes there are no post-mortem effects observable.

BROMINE.

Interior of stomach coated with thick, black layer and mucous membrane greatly congested. Exterior of stomach may be injected. Stomach contents generally thick reddish and give forth odor of Bromine. The viscera in the vicinity of the stomach may be a deep yellow color. The peritoneal coat of the duodenum is usually injected.

CANTHARIDES.

Mucous membrane of the stomach and intestines is intensely inflamed. Inflammation of the mouth, esophagus, throat, ureters, kidneys, and bladder. The mouth is swollen. The tonsils may be ulcerated. May be purulent matter covering the mucous membrane of the intestines. Sometimes congestion of the brain. When the **powder** has been taken, can recognize the shiny green particles in the stomach and intestines. Blood and fatty epithelial casts and pus in the urine.

CARBON MONOXIDE—COAL GAS.

Often rose-red or bluish-red, irregularly shaped patches on face, neck, chest and abdomen, but not on the back. They are due to a paralysis of the small arteries of the skin, which arteries consequently become injected with the changed blood, it is said. The blood is generally fluid and peculiarly red with a bluish tinge. Face calm, pale, and as a rule no foam on the lips. Right heart usually filled with blood; left contains very little. Usually some of the internal organs are congested. Putrefaction usually greatly delayed. Membranes of brain usually much injected. Sometimes lungs congested or even œdematous with effusion. Sometimes the most congestion is in the abdominal cavity.

CHLORAL.

Odor of drug may be observed. Hyperæmia of brain in some cases. No characteristic lesions.

CHLOROFORM.

Frequently odor of anesthetic perceptible. Rigor mortis persistent. Retarded putrefaction. No characteristic lesions **in death from inhalation**. Bronchial tubes, lungs and vessels of brain may be congested. Heart often found flabby and collapsed. The blood is dark and fluid. The post-mortem appearances when **Chloroform** has been **swallowed** are chiefly a redness of the mucous membrane of the stomach. Epithelium of pharynx, epiglottis and esophagus partly detached, whitened and softened.

CHROMIUM — POTASSIUM BICHROMATE.

The blood thin and black. The stomach inflamed and destroyed or marked with dark-red patches.

COLCHICUM.

Usually inflammation of stomach, intestines, and lungs. May be congestion of pia mater. Sometimes there are no abnormal appearances.

COPPER.

The surface of the body may appear yellowish. The stomach and intestines show signs of inflammation; may be ulcerated. There may be a distinct dirty, bluish-green discoloration of the intestinal mucous membrane, produced by the contact of the Copper. This is a valuable sign when present. Touching with Ammonia intensifies the tint. Particles of Copper may be found adhering to the intestinal coats. The lungs may be congested, the rec-

tum ulcerated. Sometimes the mucous membrane of the stomach and small intestines is thickened and inflamed; may be softened, ulcerated, or even gangrenous. The substance of the liver may be friable and fatty; the kidneys swollen and the cortical substance colored yellow; the pyramids a pale brown and compressed.

DIGITALIS AND DIGITALIN.

No very characteristic lesions. May be inflammation of the mucous membrane of the stomach, and congestion of the brain and its membranes. The blood dark and fluid. Right ventricle and auricle filled with blood; left empty.

ETHER.

If the autopsy is performed soon after death, the odor of the anesthetic is perceptible. The cavities of the heart are filled with dark fluid blood. Usually there is congestion of the brain and lungs.

ERYTHROXYLON AND COCAINE.

There are no very characteristic lesions. There may be congestion of the lungs and other organs and the blood fluid and dark. In acute Cocaine poisoning, hyperæmia of liver, spleen, kidneys, brain and spinal cord have usually been found.

HEMLOCK (CONIUM).

There are no characteristic post-mortem appearances. The blood usually is dark and fluid. There may be congestion of the brain or lungs. Stomach, lungs and brain usually found congested. Intestines invariably healthy.

WATER HEMLOCK (COWBANE).

Stomach red, blood fluid. May be corrosion and perforation of the stomach.

HYOSCYAMUS.

There are no characteristic lesions after death. The brain and its membranes usually are congested.

IODINE.

Appearances of a corrosive irritant poison. The liver enlarged and congested. The brain may also be congested. Ulcers are sometimes found in the stomach. Lungs natural. The other lesions are such as are usually produced by an irritant poison.

LEAD.

The post-mortem signs are not very distinct. There may be inflammation and contraction of the alimentary canal; the stomach may be whitened. In chronic lead poisoning there is a granular condition of the kidneys; the large intestines may show signs of contraction, and the muscles specially affected present a whitish, flabby appearance. May be a grey-black appearance of the intestinal mucous membrane, due to a deposit of Lead Sulphide. As a rule the stomach contains no unabsorbed poison.

MERCURY — CORROSIVE SUBLIMATE.

Corrosive Sublimate is said to take 2 hours to reach the urine, 4 hours to reach the saliva, and is eliminated from the system in 24 hours. Post-mortem signs are mainly found in the alimentary canal. The mucous membrane of the mouth, fauces and esophagus is softened and presents a whitish or bluish-grey color. Frequently the stomach is

softened, particularly at the cardiac end of it, and portions of it may be destroyed. More or less intense inflammation always present; the mucous membrane often of a slate-grey color and corroded. The stomach coats are sometimes very much blackened, probably resulting from Sulphide of Mercury. The intestines, particularly the cæcum, may present the same appearances. There may be inflammation of the kidneys and bladder, the bladder empty and contracted. There is marked congestion of the kidneys about the Malpighian bodies; the epithelial cells deformed, granular, and more or less destroyed. More or less intestinal inflammation has been caused by Mercuric Cyanide, Mercuric Iodide, White Precipitate, and Turpeth Mineral.

MERCURIC CYANIDE.

Stomach and intestines appear greatly inflamed.

POISONOUS MUSHROOMS.

Stomach and intestines usually inflamed and may be gangrenous. The vessels of the brain are as a rule much congested. The liver is enlarged. Search the stomach for the gills and spores of the mushroom. The spores of the common mushroom are oval and dark slate-colored. The discovery of pink irregular spores, or of rusty brown irregular spores, or of round white prickly spores, would be good evidence that a poisonous mushroom had been eaten. Plain round spores might indicate either edible or poisonous. Identify the fungus.

NUX VOMICA AND STRYCHNINE.

No characteristic appearances. Brain and spinal cord may be congested and considerable blood effused. Blood usually fluid and often very dark. Stomach and lungs sometimes found intensely congested. Heart usually has right side gorged with

blood, sometimes is empty and contracted. Lungs congested. Usually relaxation of body at time of death, but rapid, extreme, persistent rigidity ensues soon after it. Rigidity usually remains for a long time; may disappear within 24 hours or last two months. All these leading symptoms rarely produced except by this poison. Bladder usually contains urine, which should of course be preserved for chemical analysis.

OPIUM AND MORPHINE.

No very certain nor characteristic signs. The blood is as a rule fluid. Stomach and intestines usually appear normal. The peculiar Opium odor may be noticed as soon as the stomach is opened. The vessels of the brain usually found in a turgid state, a serous effusion into ventricles and at the base of the brain. Lungs and other vascular organs may be congested. May be heart clots in both sides of heart and a thrombosis of the pulmonary artery. External surface of body is either livid or pale. Bladder is full of urine. These are, however, not characteristic of death from this poison. Pupils are sometimes contracted, sometimes dilated. Sometimes there is nothing abnormal in the post-mortem appearances, and a pathologist could not in any single case positively determine the cause of death from only the organic appearances.

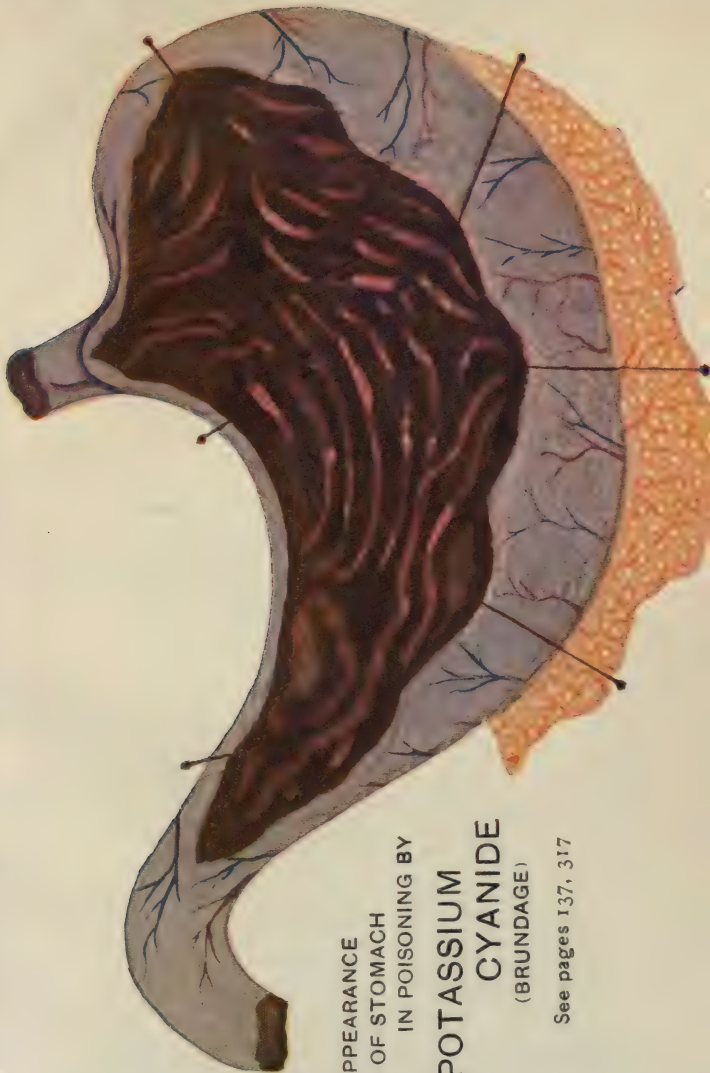
PHOSPHORUS.

Post-mortem appearances vary according to the form of poison taken, but usually those of a corrosive irritant poison. When the poison is taken in a pure state or dissolved in oil, the esophagus and other portions of the alimentary canal usually show the injurious effects. Rapidly fatal cases exhibit signs of irritant poisoning. If death is delayed there may be a softening of the stomach, a peculiarly

jaundiced skin and ecchymosis beneath pleura, peritoneum, pericardium, and in lungs, kidneys, bladder, uterus, muscles and subcutaneous tissue (probably all due to a rapid disintegration of the blood corpuscles). The lesions in many respects resemble the most aggravated forms of sea scurvy. The visceral cavities may contain bloody fluid. May be luminosity of the stomach or other parts. The liver is usually enlarged, doughy with well marked acini and cells filled with large fat drops. A remarkable, acute, fatty degeneration of the liver, kidneys, heart and other muscles and usually of the walls of the arterioles and capillaries constitute the most marked lesions. The blood is usually dark and fluid, but of a syrupy consistence. The most constant stomach lesion is a granular degeneration of the cells, filling the gastric follicles, thus altering the appearance of the mucous membrane, which becomes white, grey or yellow and thick and opaque. There may be perforation, but usually small circumscribed spots of inflammation, erosion or gangrene. The small intestine may be normal or congested. The heart is usually discolored, empty and contracted, but may contain a small quantity of fluid blood. Phosphorus has caused death without leaving recognized lesions.

POTASSA — SODA — AMMONIA.

The mucous membrane of mouth, throat, esophagus and stomach softened, detached, and chocolate-colored or black in recent cases. Signs of ulceration in esophagus and stomach or intestines, associated with more or less constriction, when death has resulted from the secondary effects of the poison. In some cases of poisoning by stronger Ammonia there may be perforation of the stomach, with congestion and blackening of its mucous membrane.



APPEARANCE
OF STOMACH
IN POISONING BY
**POTASSIUM
CYANIDE**
(BRUNDAGE)

See pages 137, 317

POTASSIUM CHLORATE.

Blood usually brownish and thickened. Kidneys injected.

POTASSIUM CYANIDE. (See Plate.)

The appearances in poisoning by Potassium Cyanide are mainly such as are described under Hydrocyanic Acid, with the addition perhaps of caustic local action. When the poison is taken directly after a hearty meal, there may be no signs of corrosion or even redness, owing to the protection of the stomach by its contents, or the neutralization of the Potassium Cyanide by the acid of the stomach. Erosions of the lips may be caused by a very strong solution of the poison and the caustic effect may be traced in the mouth and esophagus to the stomach and duodenum; but this is not common, the stomach and duodenum only showing the local effects. The mucous membrane is swollen, feels soapy, may be ulcerated, and is colored a deep red or blood-red; its reaction is strongly alkaline; crests of stomach folds may be grayish white. The contents have odor of bitter almonds. There may be ammoniacal odor present. The coloring matter of the blood, dissolved out by the Potassium Cyanide, frequently dyes the upper layers of the epithelium, as a post-mortem effect; this can be imitated by digesting the mucous membrane of a healthy stomach in a Potassium Cyanide solution. The dose of the poison and the condition of the stomach as regards emptiness, of course, entirely govern the intensity of these changes. Although the stomach may be empty when the poison is taken, a dose just large enough to destroy life may produce but little redness or swelling of it. Inflammatory changes in the larynx may be produced by vomit drawn into the air passages in vomiting. The blood often exhales the odor of the poison, and as the acid may often be distilled from it, some of it should be preserved for analysis.

Essence of Almonds may produce the slight inflammation of the other essential oils, but no erosion, no strong alkaline reaction, nor effects, such as the caustic Potassium Cyanide produces.

POTASSIUM NITRATE.

The contents of the stomach may be mixed or tinged with blood. Interior of stomach and intestinal canal exhibit signs of severe inflammation. Mucous membrane may be detached in places, and there may be perforation.

PTOMATROPINES.

Swelling of pharynx, esophagus and mucous membrane of the stomach. May be venous hyperæmia of brain, lungs and kidneys. There may be injection of intestines and swelling of the solitary and Peyer's patches and degeneration of the heart muscle.

SAVINE.

The capillary and venous systems usually congested. Heart full of blood, particularly on right side. The blood is of a black color. A general plethora of intestinal vessels. Usually more or less inflammation of bowels, stomach and intestinal tract, with congestion of kidneys.

SILVER CYANIDE IN POTASSIUM CYANIDE.

(Counterfeiter's Silver Coating).

Distinct smell of Hydrocyanic Acid. Eyes glistening; pupils dilated; jaws clenched; strong rigor

mortis ; cerebral membranes congested ; lungs highly congested ; bronchial tubes and lung cells filled with frothy mucus ; right side of heart full of black fluid blood, left side empty ; bladder empty ; stomach red. (Death in 40 minutes ; autopsy after 32 hours).

SILVER NITRATE.

In rapid poisoning, a blue line around gums ; in slow poisoning, a bluish tint of the body. Stomach and intestines show either a white color from the action of the caustic salt, a black from decomposition of animal matters, or an intensely red color, due to inflammation.

TOBACCO AND NICOTINE.

No characteristic signs from Nicotine. Is congestion of liver, brain and lungs. A diffused redness over the mucous surfaces of the stomach and bowels. The heart is empty. Blood dark and fluid. May detect Nicotine in the body a long time after death. Has been found in animals after the lapse of years. Nicotine should be sought in the stomach, lungs and liver.

ZINC.

Zinc Sulphate is apt to produce inflammation. Intestinal tract inflamed and usually congestion of brain and lungs. Mucous membrane of stomach may be much wrinkled. Stomach and intestines contracted.

Zinc Chloride corrodes. A peculiar whiteness and opacity of mucous membrane of mouth and esophagus. Stomach usually corrugated, contracted, opaque, leaden color, leathery and hard. All parts of very acid reaction. Lungs and kidneys congested as a rule. The fluid in the stomach has the appearance of curds and whey. There may be fatty degeneration of various internal organs.

POST MORTEM KEY TO POISON.

APPEARANCE (POST MORTEM).		PROBABLE CAUSE OF DEATH.
SKIN	{ Black in patches.....	Arsenic, silver.
	{ Bright-red spots or patches.....	Coal gas, cyanides, hydrocyanic acid.
	{ Blue	Carbolic acid, coal gas, nitro-benzol, silver-nitrate. Cyanides.
	{ Marble-like, pale	Arsenic, aconite (occasionally).
	{ Hemorrhages into	Phosphorus, poisonous mushrooms.
	{ Icterus of.....	Phallin, phosphorus, solanine.
	{ Papular, pustular or ulcerative alterations of.....	Alkalies, bromine, carbolic acid, chromates, corrosive acids, ergot, iodine.
	{ Tan-like and partly necrosed.....	Bromine.
EXTREMITIES gangrenous.....		Ergot.
RIGOR MORTIS persistent.....		Chloroform, nux vomica, strychnine.
PUTREFACTION	{ Greatly retarded	Alcohol, arsenic, carbolic acid, chloroform, mineral acids.
	{ Hastened (no rigor mortis).....	Poisonous mushrooms.
LIPS and around MOUTH	{ Yellowish or brownish...	Carbolic acid, nitric acid, sulphuric acid.
	{ Whitish ..	Carbolic acid, oxalic acid, sulphuric acid.
HAIR	{ Greenish.....	Copper (chronic poisoning).
	{ Sudden loss of.....	Arsenic.
PUPILS	{ Contracted.....	Opium, physostigmine.
	{ Dilated.	Belladonna, gelsemium, hyoscyamus, scopolamine, stramonium. Alcohol (as [a rule].)
MUSCLES, Atrophy of.....		Arsenic, ergot, lead.
MOUTH, Inflammation of.....		Iodine.
TONGUE and mouth inflamed, teeth loose		Bismuth, mercury.
GUMS	{ Blue line on.....	Lead.
	{ Dark line on.....	Bismuth, mercury, silver.
JAW necrosed.....		Phosphorus.
MOUTH THROAT and STOMACH	{ Yellow, green or brown.....	Nitric acid, oxalic acid (occasionally).
	{ Grayish, brownish or blackish.....	Sulphuric acid.
	{ Corroded and softened { Whitish.....	Carbolic acid, chloroform (by mouth), corrosive sublimate, hydrochloric acid, oxalic acid (occasionally).
	{ Chocolate-colored or black	Hydrochloric acid, nitric acid, ammonia, potassa, soda.
		Quick-lime.
BLOOD	{ Intensely red	Carbon monoxide, cowbane, illuminating gas.
	{ Bluish-red or cherry-red, and fluid	Arsenic (occasionally), potassium chlorate, nitric acid.
	{ Brownish and thickened	Savine, tobacco.
	{ Black	Bromine.
{ Extended coagulation of.....		

POST MORTEM KEY TO POISON (Continued).

APPEARANCE (POST MORTEM).		PROBABLE CAUSE OF DEATH.
ODOR (characteristic) ; especially noticeable upon opening body.....		Alcohol, amyl nitrite, anilin, acetic acid, arsenic, ammonia, bromine, camphor, carbolic acid, chloroform, chlorine, cyanides, ether, ethyl bromine, hydrochloric acid, hydrocyanic acid, iodine, nicotine, nitrobenzol, opium, phosphorus, rue, savine, tobacco.
STOMACH	Contents	Green or bluish green.....
		Yellow or reddish yellow.....
		[also walls] Turn black when exposed to ammonium sulphide..
		Hematic.....
	Walls	Luminous in dark.
		Contain shining green particles..
		Gills and spores...
		White spots.....
		Purple-red (mucous membrane).
		Black.....
GASTRO INTESTINAL CANAL	Contains	Bismuth, copper, lead, mercury.
		Arsenic, potassium nitrate.
		Phosphorus.
		Cantharides.
	Walls	Poisonous mushrooms.
		Arsenic, carbolic acid.
		Zinc.
		Corrosive sublimate, acetic acid (near pylorus), oxalic acid (occasionally).
	Contains	Arsenic.
		Iodine.
		Zinc.
		Carbolic acid, oxalic acid, zinc, H,Cl [(Ridge's).
	Walls and Contents	Arsenic.
		Small pieces of wood.....
		Leaves.....
		Matches (phosphorus).
	Contains	Aconite, belladonna, hyoscyamus, savine, stramonium, tobacco.
		Fragments of hair-coated seeds.....
		Fragments of non-coated seeds.....
		Nux vomica.
	Walls and Contents	Castor oil, hyoscyamus, laburnum, stramonium.
		Mineral particles
		Antimony, antimonious sulphide, arsenous oxide or sulphide, metallic arsenic, calomel, chromium preparations, iodine, mercuric oxide.
		Hemorrhagic material.....
	Walls and Contents	Arsenic, baryta, phosphorus.
		Acid.....
	Walls and Contents	Acids, acid salts.
		Alkaline.....
	Walls and Contents	Alkaline earths, caustic alkalies, potassium cyanide.

POST MORTEM KEY TO POISON (Continued).

APPEARANCE (POST MORTEM).		PROBABLE CAUSE OF DEATH.
INTESTINES	Villi turn black.....	Silver.
	Walls and Contents of Duodenum, etc.	Yellowish Nitric acid, picric acid, plumbic chromate.
		Greenish Cupric sulphate, Paris green, Scheele's green, verdigris.
		Brownish Bromine, iodine, phosphorus, potassium chromate.
	Large Intestine	Black and ulcerated Bismuth.
		Dysenteric Castor beans.
ABDOMINAL VISCERA	General contraction of or gray-black mucous membrane	Lead.
	Bluish-green mucous membrane	Copper.
	Yellow patches	Arsenic.
	Red "	Antimony.
LIVER, fatty	Grayish or blackish patches, and corroded...	Mercury.
HEART, fatty degeneration of, also of muscles and kidneys.....		Ammonia, antimony, arsenic, iodine, phallin, phosphorus.
KIDNEY, rough, grating, sound in cutting		Ammonia, antimony, arsenic, iodine, phallin, phosphorus.
LUNGS, CEdema of.....		Baryta, lead, mercury, oxalic acid.
BRAIN		Morphine, muscarine, nicotine, pilocarpine, etc.
	Odor of peach pits or hydrocyanic acid.....	Hydrocyanic acid in some form.
	Congestion of	Alcohol, digitalis, etc.

CHRONIC POISONING
AND
DRUG HABITS.

PART X.

CHRONIC POISONING

AND

DRUG HABITS.

By more or less continued and prolonged use of the various preparations of Alcohol, Opium, Morphine, Chloral, Chloroform, Cocaine, Ether, Paraldehyde, Wormwood, etc., some persons acquire a habit for such poison, and a state of chronic poisoning.

The brain structure is deranged, mental function is more or less seriously disturbed, the vital organs are weakened or actually diseased, and a degeneration of the whole physical economy is induced.

Furthermore, the effects, most unfortunately, are not limited to the individual, but may be transmitted to succeeding generations, producing various brain abnormalities, perversion of morals, and defects of mind.

Of all the various kinds of chronic poisonings, the most important are those by Alcohol, Opium (including Morphine), and Cocaine.

Dr. Kellogg, formerly superintendent of the New York State Asylum, says:

"There are chronic intoxications from poisons intentionally taken, as in the widespread drug habits. * * * In their physiological effects there is a specific difference in poisons as to the prevailing emotional mood excited, but in their pathogenetic relations to insanity they result in maniacal or melancholic states more in accordance with individual and constitutional peculiarity.

Toxic insanity is acute or chronic vesania caused by the

medium of toxic substances acting on the cerebro-spinal or sympathetic nervous system and clinically manifested by motor, sensory, trophic, vasomotor and psychic disorder, varying according to the individual idiosyncrasy of reaction to the toxic agencies which have invaded or been generated in the organism.

In some toxic cases, motor anomalies, in others sensory perversions, and in others intellectual disorder may predominate, according to the vascular areas and nervous tracts involved in the pathological changes initiated by the poison. The cerebro-spinal lesion may give rise to a symptom complex like that of general paresis.

Some of the more common toxic agents which cause insanity are here named and classified:

- I. MINERAL POISONS AND DRUGS.—1, Lead; 2, Mercury; 3, Arsenic; 4, Chloral; 5, Bromide of Potassium; 6, Iodoform; 7, Paraldehyde.
- II. VEGETABLE POISONS.—1, Opium; 2, Belladonna; 3, Cannabis Indica; 4, Hyoscyamus; 5, Stramonium; 6, Tobacco; 7, Cocaine; 8, Conium; 9, Erythroxylon Coca; 10, Astragalus Hornii; 11, Secale Cornutum.
- III. INTOXICANTS AND NOXIOUS GASES.—1, Alcohol; 2, Ether; 3, Chloroform; 4, Carbonic Oxide; 5, Sulphurous Acid Gas.
- IV. ACUTE INFECTIONS AND DISEASES.—1, Typhoid Fever; 2, Smallpox; 3, Scarlet Fever; 4, Typhus Fever; 5, Diphtheria; 6, Cholera; 7, Puerperal Sepsis; 8, Epidemic Influenza; 9, Purpura; 10, Erysipelas; 11, Bubonic Plague; 12, Lepra Vera; 13, Lessa Humana.
- V. AUTO-INTOXICATIONS.—1, Leucomains; 2, Ptomaines.

Some of these toxic agents only act upon special tissues, but most of them deleteriously affect the entire organism, and their evil effects continue long after their elimination from the system."

ALCOHOL — ALCOHOLOMANIA — CHRONIC ALCOHOLISM (CHRONIC ALCOHOLIC POISONING).

By alcoholomania is meant the possession of an overpowering impulse, crave, craze or mania for intoxication by alcohol.

By chronic alcoholism is meant the morbid effect of chronic excess in the use of alcoholic beverages.

The spirit obtained from potatoes is the most injurious of all the alcoholic beverages, owing to the large amount of amyl alcohol (fusel oil) which it contains. Many of the cheap spirits have this as their basis.

SYMPTOMS:

The system gradually undergoes an alcoholization. Nutrition is impaired, the various organs of the body gradually undermined, the natural physiological processes being by degrees converted into pathological ones. The alcohol irritates the stomach and digestive apparatus, and precipitates the pepsin of the gastric juice, inducing heart burn, neuralgia of the stomach, belching, melancholia and various distressing symptoms associated with chronic dyspepsia. The structure of the liver is gradually altered and it becomes enlarged and fatty or contracted and cirrhotic. The kidney is seriously impaired. The heart becomes more or less fatty, hypertrophied, weak, flabby and incapable, so that the patient suffers from palpitations, dyspnoea, "stitches," etc. Frequently the tongue is parched and furred, and the breath foul. There is often persistent and urgent thirst, nausea, flatulence, severe pain in the vicinity of the stomach, loss of appetite, dislike for food, sense of severe coldness or heat, stabbings, twitchings and uneasiness throughout the body. The limbs become enfeebled and tremulous. There is more or less mental degradation, low-spiritedness, indeterminate fears of impending disaster, irritability, cowardliness, cunning, indecision of character, inability to concentrate the thought, violence of temper, untruthfulness and weakness of purpose. The chronic alcoholic is a vacant, silly and foolish dement.

The morbid tissue changes produced by the alcohol deprave the brain, intellect and moral sense,

and the anesthetic influence of the alcohol so dulls the perceptive faculties as to make the alcoholic unconscious of the damage being done to his body and mind. Destructive changes, which normally are painful, elicit no complaint from the benumbed senses. Violent acts, even manslaughter, may unintentionally be committed through the inability to estimate or determine the amount of force employed in various physical efforts. An intended friendly tap may thus be delivered with crushing force. Unusually immoral and indecent acts may be committed through an enfeebled, deteriorated and degraded moral sense, dependent upon cerebral and other tissue changes. There is a more or less complete paralysis of will power, mind and morals. Delirium tremens, dementia, mania, epilepsy, or even general paralysis may characterize the progress of the disease.

In beer and other malt-liquor-drunkards, there is more or less tendency to obesity. There is puffing and blowing upon the least exertion, and the movements are more or less sluggish and clumsy. The features become dull and expressionless, the face red or purplish, and the blood vessels in the regions of the eyes and nose enlarged and congested. The skin is blotched, greasy and glistening, the eyes red and moist and the conjunctiva yellowish. Death, frequently, finally occurs from embolism, syncope, or dropsy.

Spirit drinkers incline to emaciation, but ultimately, from ascites or anasarca resulting from cirrhosis of the liver and kidneys and fatty degeneration of the heart, may become quite rotund or large limbed. Their restlessness, imaginings, and disturbed, unrefreshing sleep often induce a highly dangerous resort to opiates or other narcotics. They suffer from delusions of persecution, and some of them experience a sense of double consciousness.

TREATMENT:

Various mysterious chemicals, medicinal preparations and processes, including hypnotism, have from time to time been exploited and claimed to be a specific remedy for chronic alcoholism. The so-called "gold cure" has seemed to prove efficacious in some cases, and a most dismal failure in others. As a rule the best plan to pursue is to commit the alcoholic to some institution where he will be inspired with hope, his will fortified, poisoning discontinued, and his system built up with such tonics as iron, arsenic, cod-liver oil, etc.

ARSENIC — CHRONIC ARSENICAL POISONING.**HISTORY:**

Chronic poisoning by arsenic may be caused by arsenical wall papers, candles, artificial flowers, toys, India rubber balls, carpets, advertising and playing cards, floor-cloths, the colored wrappers of some cigarettes, japanned goods, etc.

SYMPTOMS:

Thirst and dryness of mouth; nausea; vomiting; perhaps slimy, bloody diarrhœa; voice rough and harsh; eyes red and smarting; eyelids puffed; appetite lost and a sense of weight or soreness at the pit of the stomach; skin dry, covered with sore spots or scales; disturbed sleep; aching in joints or limbs; there may be spitting of blood, great loss of flesh, and general debility.

TREATMENT:

Remove the cause. Provide plenty of fresh air and various tonics, such as iron, quinine, cod-liver oil, strychnia, etc. A complete change of air and scene often proves of the greatest benefit.

CHLORAL—CHLORALISM.

HISTORY:

Chloralism may be the result of the long continued use of the drug as a sleep producer, to relieve neuralgia or other pain, etc.

SYMPTOMS:

The chief symptoms are a disturbance of digestion, chiefly from the direct effect of the drug upon the mucous membrane of the stomach; an eruption of the skin, dyspnœa, depression, vertigo, insomnia, excitement, volubility, reduction in nerve power, lessened mentality, etc.

TREATMENT:

Prevent the obtaining of the drug, and build up the system. This can oftentimes be best accomplished by placing the patient in a good sanitarium for a time.

COCAINE — THE COCAINE HABIT — COCAINOMANIA—COCAINE INEBRIETY—COCAINISM.

HISTORY:

The dangers and disasters resulting from a protracted or habitual use of cocaine can scarcely be enumerated or estimated. This is probably the most seductive, dangerous and mentally, physically and morally destructive of all the drug habits. Erlenmeyer has denominated cocaine the third scourge of humanity, following in order after alcohol and opium, in this respect. Cocaine fascinates by the promptness with which it relieves all sense of exhaustion, dispels gloom and exhilarates, producing a sense of happiness and well-being which transports at once to a longed-for elysium.

Primarily, the after-effects are scarcely perceptible, but through continual indulgence an intense craving for the drug or its effects is produced.

SYMPTOMS:

The habitu   is afflicted with sleeplessness, nervousness, tremulousness, nervous and muscular irritability, illusions of sight and hearing, insensibility to pain, indecision, dyspepsia, palpitation, disinclination to work, avoidance of friends and society, insane jealousy, mistrust, moral perversion, bodily emaciation, decay of mind, etc. When the toxication is frequently repeated there is a tendency to raving insanity.

Regarding cocainism, Superintendent Kellogg, of the State Asylum, says:

"Cocainism develops a reasoning form of mental alienation with change of hallucinations and corresponding delusions, anxious and excitable moods, attaining melancholic states of agitation on withdrawal of the drug, or even attacks of stuporous collapse."

Regarding a comparison of the cocainist with the morphinist and the deleterious effects of cocaine, Professor Berkley, of Johns Hopkins University, in his "Treatise on Mental Diseases," in speaking of drug habits, says:

"Even less than the Morphinist are the Cocaine debauchees to be trusted, inasmuch as their moral rectitude and will power have always suffered severely. * * *

Under the deleterious influence of the continued use of Cocaine, especially when it is superadded to the Morphine habit, the gravest somatic indications may arise. The bodily weight sinks rapidly, even 1-5 to 1-3 of the whole being lost within a few weeks. The skin hangs in folds and has a dirty yellow tint, the countenance assumes a distressed look, muscular weakness and tremor become profound.

As happens in other states of inanition, the reflexes become exalted, cramps make their appearance, there is muscular unrest with tremor, particularly noticeable in the tongue. The symptoms of collapse increase. There is a growing tendency to fainting attacks, with irregularity in the cardiac action, accompanied by profuse sweating and dilatation of the pupils. Sleep is much disturbed. The patients usually retain their appetite and powers of assimilation, but the waste being greater than the supply, rapid

emaciation results. Sometimes from the direct poisonous influence of the alkaloid, sometimes from the continued denutrition of the entire body the person habituated to Cocaine acquires an indubitable insanity, which assumes the customary type of a hallucinatory psychosis. Usually after a short prodromal period of motor unrest, anxiety, mistrust of family or companions, and increasing irritability are noted. Hallucinations which may involve all the special senses, quickly follow. Those of hearing are the most frequent. Obscene language and scolding voices are overheard; vile words are shouted at the sufferers; they hear noises made by thieves in the midnight watches; they are threatened with injury; their most secret thoughts are blazoned forth to the edification of the populace; they are made exhibitions of to the delight of their enemies; the roar of machinery, the clanging of bells, wailings, loud screams, and shrieks of murder are somewhat less frequent. Hallucinations of sight customarily accompany those of hearing. * * * Soon the cocaine sufferer becomes dangerous to himself, his family or the community."

Regarding the prognosis in these cases, Prof Berkley says:

"This is most gloomy. Even though the patient recover from one attack, he very frequently relapses into his evil habits. In the most favorable cases there ever remains an extraordinary weakness of the will power, with accentuated tendency to relieve the physical and psychical languor, by substituting for the cocaine, alcohol, morphine, antipyrine and other nervines in large quantities."

Although the cocaine habit has in some instances been the result of experimentation or of unwise medication, it usually results from the careless and persistent taking of cocaine as an analgesic, or of taking remedies to cure various ailments, or taking so-called cures for the alcohol or opium habit, which remedies or cures contained cocaine. The attempt to substitute cocaine for alcohol or opium, is as hazardous as it is unsuccessful, the evil only being added to, instead of lessened.

TREATMENT:

The treatment is practically the same as that for morphinism (q. v.). Berkley says:

"Persons addicted to the combined morphine-cocaine habit should be allowed their morphine, at least until the immediate effects of the cocaine have passed away. In chronic cocaine insanity home treatment is rarely admissible, especially as there are nearly always dangerous tendencies."

THE CYANIDES.

HISTORY:

Photographers, electroplaters and gilders frequently suffer from chronic poisoning by the cyanides.

SYMPTOMS:

Headache, dizziness, ringing in the ears, pains in the cardiac region, dyspnœa, nausea, pallid skin, offensive breath, etc.

TREATMENT:

Promptly resort to ammonia inhalations, cold douches, chloride of lime held to the nostrils, etc., etc.

Employ electricity, friction and artificial respiration if necessary.

A mixture of ferrous and ferric sulphates with sodium or potassium hydroxide or carbonate is the best antidote to employ.

ETHER — ETHERISM — CHRONIC ETHER POISONING.

HISTORY:

Ether drinking as a habit was at one time quite extensively practiced in Ireland. It was indulged in by people of all classes and even by children. It was sold in shebeens and groceries, often bartered for poultry and farm produce, being delivered at the doors of the people by hawkers. From a teaspoonful to two or more fluid ounces were drunk at a time by the users. The average daily quantity by the moderate ether-drinker was two drachms three or four times a day.

The habit, in time, extended to England, Scot-

land, France and the United States. Some ether-tippers inhale it instead of drinking it, thus using about a pint per day.

SYMPTOMS:

Ether-drinking produces mainly symptoms of a purely functional disturbance. There is burning pain in the stomach, digestive disturbances, loss of appetite, and symptoms of acute or chronic gastritis. Insomnia, tremors, pallor, gloom, fear, despair, suspicions, chills, lemon-colored or blue skin, irregular heart action, tottering gait, loss of strength, premature decay, etc., are among the chief symptoms.

TREATMENT:

Isolation, predigested food, soothing gastric treatment, and the general treatment employed in chronic alcoholism.

LEAD: — PLUMBISM — LEAD COLIC — LEAD PALSY — WRIST DROP.

HISTORY.

Compositors, house painters, potters, card players, paper hangers, file cutters, electric light workers, japanners, enamellers and others are very apt to be afflicted with lead poisoning.

Some hair dyes and cosmetics, hat linings, or goods whitened with a lead preparation, tea packed in lead, water or beer which has stood for some time in lead pipes, or soda water from lead-topped syphons, spirits which have been in leaden receptacles, wine sweetened with lead acetate, foods from lead-soldered tins, or lead wrappers, or loaf sugar from lead moulds, snuff adulterated with red lead, etc., are sometimes the source of lead poisoning.

SYMPTOMS:

A general sense of ailing; anæmia, dull-colored skin. A blue line at the edge of the gums where they meet the teeth is one of the first and most last-

ing symptoms. It is not found when there are no teeth and shows plainly in those who neglect to clean their teeth. Not found usually on those who attend to them. It is the result of the formation of lead sulphide.

In Lead Colic — “Painters’ Colic” — the chief symptoms are a tearing pain in the umbilical region, which, as a rule, is relieved by pressure; the walls of the abdomen are rigid and retracted; there are usually also constipation and other digestive disturbances; there may be lead paralysis or wrist drop in lead poisoning; also cramps in the calves of the legs, in the scrotum and penis in men, in the uterus in women; pain may occur in the joints, particularly those of the extremities.

Other symptoms of lead poisoning are headache, vertigo, insomnia, irritability of mind, anæmia, emaciation, disturbed digestion, anesthesia of portions of body, sexual degeneracy, tearing, burning pain in arms and shoulders, convulsions, etc. In women profuse menstruation or even abortion may occur.

TREATMENT:

Give a blue pill at night, followed by a saline in the morning. Iron, Magnesia, Chloroform, and Potassium Iodide, 3 or 4 times a day, are beneficial. Tincture of Belladonna may be given to relieve the colic. Nourish well, and give Cod-liver Oil, Malt Extract, Hypophosphites, Wine, etc. Faradization and massage are helpful. Strychnine in large doses is beneficial. Employ warm baths frequently.

MERCURY — MERCURIALISM — PTYALISM (SALIVATION) — MERCURIAL TREMORS (SHAKING PALSY).

SYMPTOMS:

In chronic mercurial poisoning there is usually debility, nausea, vomiting, colicky pains, a metallic taste in the mouth; the gums are dark red, swollen

and tender; the teeth adhere; the tongue is furred and swollen and the breath foul; may be hacking cough and spitting of blood.

In ptyalism the saliva is greatly increased in quantity (sometimes as much as $1\frac{1}{2}$ pints secreted in 24 hours).

There may be ulceration of the mucous membrane of the mouth, a skin eruption, and even periostitis; later there may be mercurial tremor, paralysis, or convulsions. The mercurial tremors of those engaged in handling mercurial compounds or exposed to the fumes of mercury, affect first the upper extremities and gradually the whole body. Co-ordination power is lost and the movements are erratic; ultimately result in mania and imbecility.

[Salivation is sometimes produced by Antimony, Bromine, Lead, Hydrocyanic Acid, Nux Vomica, Gold, Cantharides, Digitalis, Conium, Belladonna, Opium, and especially by Potassium Iodide. Great fetor of breath and painful sponginess of gums is peculiar to mercurial salivation, and in case of doubt the saliva should be examined for mercury].

TREATMENT:

Tonics, fresh air, albumin, port wine, chlorate of potash, gargles, plenty of good food, and perhaps small doses of Potassium Iodide, comprise the best treatment.

OPIUM AND MORPHINE — THE OPIUM HABIT — THE MORPHINE HABIT — OPIOMANIA — MORPHINOMANIA — CHLORODYNOMANIA — ETC.

HISTORY.

Opiomaniacs and morphinomaniacs by long-continued habitual misuse of these drugs are enabled to take enormous doses of them without the effects proving immediately fatal. Various devotees have

been known to average such large quantities, daily, of one or the other, as the following: Opium, 30 grains; an ounce or more of Tincture of Opium; of Morphine salts, 8 grains or more. Three ounces of Laudanum daily have been taken for a week or two at a time by a young woman habitu  ; another woman drank $1\frac{3}{4}$ ounces daily for 7 months; still another woman drank of a mixture of Laudanum, Spirit of Chloroform and Spirit of Lavender (equal parts), 7 ounces daily; every day for years, an adult, 50 years of age, drank $2\frac{1}{2}$ ounces of Laudanum and $1\frac{1}{2}$ ounces of Paregoric; De Quincey finally took 8,000 to 10,000 drops of Laudanum daily; doses of 20, 40, or 60 grains of Sulphate of Morphine are not rare.

Such surprising quantities as the following have been recorded: The drinking by an adult female of a pint of Laudanum daily; the taking by a man of 150 grains of solid Opium in one day in 30 grain doses; the daily hypodermic injection, in a man, of 60 grains of the Hydrochlorate of Morphine; the taking of a fluid ounce of Chlorodyne (Oil of Peppermint; Prussic Acid and Muriate of Morphine; the Morphine $2\frac{1}{2}$ gr. to the ounce). etc.

It would appear that some children are kept more or less under the effects of Morphine by the use of various soothing nostrums. Mrs. Winslow's Soothing Syrup is said to contain about one-eighth grain of Morphine to the ounce; Godfrey's Cordial about one grain of Opium in two ounces, and Dalby's Carminative one grain in six.

SYMPTOMS.

By the narcotizing, anesthetic influence, of both Alcohol and Opium, sensation is deadened, nervous ability benumbed, the vital powers and intellectual faculties undermined by starvation, resulting in an atrophic physical wasting and a depraved moral sense.

Opium produces so depressant an effect on the

special nerve centres and general nervous system as to cause frequently sterility in women and impotence in men.

The hereditary influence of these drugs is more apparent in alcoholists than in opiumists or morphinists.

Cardialgia is a common symptom where either of these two poisons are heavily indulged in. Opium users, as a rule, take the drug regularly. Alcoholists are apt to be periodical in their excessive use of alcohol. Opium lessens the peristaltic action of the intestines, resulting in constipation, acidity of the stomach, anorexia, deficient digestion, a foul tongue, incontinence of the urine, etc. Cardiac innervation is disturbed, resulting in attacks of false angina pectoris, and pericardial anxiety, producing alarming symptoms of distress.

The opiumist's or morphinist's skin becomes yellow, nails brittle, teeth loosened, a most profound anæmia usually results; furthermore an exceedingly obstinate sleeplessness is encountered in the final stages of chronic morphinism."

The morphine habit greatly depraves both brain and body nutrition. The body gradually emaciates. The higher brain functions undergo serious alteration manifested by loss of self-respect, a tendency to coarseness, baseness, and untruthfulness, to seek questionable associations, and, in fact, a loss of all moral restraint.

Persons addicted to the morphine or opium habit seem incapable of a correct statement of facts or occurrences. Their untruthfulness and deceitfulness are amazing. As McBride declares: "**They misconstrue statements, they habitually misrepresent and misunderstand. If a statement can be given two meanings they will apply the wrong one.**"

Their ability to inspire confidence in their statements, by earnestness, apparent frankness, and impressive solemnity of manner, although, in fact, they are cunningly and deliberately lying, is as mar-

velous as it may prove serious. In this respect some of them are possessed with a most distinct and depraved viciousness, indifferently or even with heartless satisfaction grievously misrepresenting and irreparably wronging innocent persons. And for this they may afterwards show no contrition, either lacking the moral courage to acknowledge their fault or their cerebral degeneration prohibiting their subsequent faithful interpretation of the true facts. They are thus a serious menace to the well-being of not only their own households but to the community in which they live.

As a rule the person addicted to Opium does not exhibit the tendency to violence manifested by so many alcoholists. But owing to the narcotic hold the drug has upon the nervous system, opium users are more difficult to cure than alcoholists.

Dr. Kellogg, formerly Superintendent of the State Asylum, says in his "Text Book of Mental Diseases," regarding the effects of morphinism:

"Morphinism results in amnesic states, affective perversion, irritable, suspicious and fearful delusions, complete moral degeneracy, suicidal impulses lacking force of execution and distressing hallucinations on cessation of the drug, with cramps and vasoparetic states."

Chronic Opium Intoxication is a condition of abandonment to self-gratification and utter indifference to duty and the rights and interests of others, as is confirmed by various authors, as follows:

Regarding the Morphine habit, Berkley says:

"In the mentally robust the most common cause of morphinism is the continued use of the drug for the relief of pain, neuralgias, sciatica, repeated migraines, tabetic pains, rheumatism, hepatic or renal colic, dysmenorrhœa, and a host of other somatic troubles; then, when the pain has ceased, the habit is continued for the pleasurable excitement and feeling of temporary happiness induced by it. * * * In another class of cases the patients are of a neuropathic disposition and have the same craving for morphine as a stimulant that others have for alcohol, ether, or essence of ginger. The neurasthenic, the

hysterical, the hypochondriac, the periodical melancholic or drunkard, all turn to opium for that sense of well-being only attainable while they are under the influence of some pernicious anodyne.

Still another class of morphinists is met with. * * * Persons who have become a prey to grief or despondency * * * as well as those who are sleepless or overworked are too apt to seek the haven of rest and rare sense of mental relief only to be found in the extract of the poppy.

The sleep of the opium habitué is never profound but is broken by the recurring visions which in the dream state are constantly changing. The majority of these are agreeable. * * * [but] may be of a disagreeable nature; innumerable faces float before the eye of the imagination. * * * Time is annihilated or increased to an eternity. * * *

The permanent effect * * * is shown in pronounced moral obliquities, and in the resort to any means, no matter how unscrupulous, even actual forgery and theft, to obtain the drug. The idea of any personal responsibility falls to the lowest ebb; thought action, and even the most imperative duties, are shunned. While the largest number of these unfortunates are not insane in the stricter sense of the word, there is always present a certain degree of ethical obliquity, irritability, peevishness and moroseness.

It is never safe to believe the word of an opium eater; he will prevaricate with or without reason, his disposition is uncertain and treacherous, his conscience is obtunded, he is dissolute, and has tendencies to morbid impulses."

And the distinguished author and president of the British Society for the Study of Inebriety, Dr. Norman Kerr, of London, in speaking of the chronic morphinist, says:

"He is harassed by frequent palpitation of the heart, oppressed breathing, cramps in the abdomen and leg muscles, nocturnal pains, fitful sleep with terrifying dreams, trembling and fear at imaginary or real voices. There is an exaggerated sensibility, slight pains seem to be acute agony, resolution is transformed into irresolution, with uncertainty of purpose, confusion of thought, morbid melancholy and despair, anorexia alternating with fitful voracious appetite, general constipation with, it may be, frequent prostrating diarrhœal or dysenteric attacks, salivation, listlessness, and indifference to cleanliness, personal appearance, and the claims of duty. The

moral sense is by and by perverted, so that the person's word cannot be relied on, and the no longer pleasant though necessary opiate oblivion is procured, if it cannot be honestly, by theft, the sale of one's living body, or murder. * * * * Sexual function is in general disturbed. In the female amenorrhœa prevails, in the male impotence, but in both sexes functional normality is gradually recovered on abandonment of the drug. The effects of the cachectic marasmus, which is apt to have a fatal ending, often remains long after abandonment, though in most cases they are in time overcome. Death may supervene in various ways: from some intercurrent malady, opiumists being peculiarly prone to be attacked by some diseases, while apparently almost proof against others; from an overdose taken either intentionally or accidentally; or, at rare times, from the effects of the shock incident on some surgical operation."

McBride, of California, in his most excellent article on "The Morphine Habit," says:

"In respect of the moral qualities the morphinist is a cripple and he will remain so until he regains health, if he ever does, by a slow process of character growth which can only be begun after the drug is stopped and then continued for some time subsequently. The quitting of the morphine habit is, therefore, but part of the cure. Though the patient may have quit the drug, and though he is comfortable without it, the cure is far from complete."

Nearly all morphine or opium habitués will offer some plausible, self-exonerating excuse or explanation for having become addicted to the use of the drug. They very commonly place the blame for having acquired the habit, upon the family physician, if they have such, or upon some remedy given or recommended by a friend. In the vast majority of cases their own deliberate and wanton self-indulgence and dream-state seeking, are the true cause of the habit. McBride sums up the results of his own extended experience and observations, in these cases, as follows:

"It is certainly true of a very large proportion of morphinists that they are people who are originally weak in self-control, and usually, too, they are impulsive and selfish. I have exceptionally been able to verify the common state-

ment of patients that they became addicted to the habit from the drug having first been given by a physician, so that I think many of the statements to this effect are misrepresentations. It seems to me that very many of them are voluntary victims in the sense that they began taking the drugs from precisely the same motive that most alcoholic inebriates begin to drink liquor, that is because they find pleasure in it. As a rule we have in the morphinist as in the alcoholic inebriate, a man who was originally weak in self-control, and strong only in the qualities that thrive on human frailty. The number of these people who have originally some twist in the mental make-up is surprisingly large, for, however talented they may be, and I have found some unfinished geniuses among them, the majority are certainly ill-balanced, unadjustable people, with a genuine talent for selfishness, and who in their constant attempts to make themselves comfortable fall upon the habit that becomes their ruin. The chapter is yet to be written which will fittingly describe the mental peculiarities and moral deficiencies of these people from whom this straggling, ruined army of humanity is recruited. It is not, therefore, probable, indeed it is hardly possible, that such people who in health begin the habit, will, when self-control, always weak, has been further weakened by disease or morbid habit be able to resist the temptation to indulgence. To consider the morphinist cured and ready to go back into the world soon after the use of the drug has been discontinued, is like expecting the typhoid patient to go about his business as soon as the temperature has dropped to normal, ignoring the tedious convalescence and the perils that beset it. The cure of the morphine habit, like the cure of chronic insanity, to be permanent must be carried to a restoration of lost character elements."

TREATMENT:

Of the various methods of cure of the opium or morphine habit, that of more or less rapid reduction of the size of the dose is undoubtedly the most successful and inflicts the least suffering upon the patient. Sudden and complete withholding of the drug is rarely if at all practiced now as a means of cure. The latter course entails severe suffering without any material benefit.

McBride's views are expressed as follows:

"Of the possible methods of cure that of sudden, entire withdrawal is not practiced now as far as I know. Either rapid or slow reduction enables the habit to be broken off with comparatively a small amount of suffering."

Kerr says:

"In the drastic abrupt withdrawal, however, the agonies of the sufferer are so practically unbearable, as a rule, that only in rare cases has the writer carried out this plan successfully."

The opiumist or morphinist can, except very rarely, only be treated successfully when under perfect control. This is almost impossible in private practice, hence an institution is the proper place for such habitu  . There he can be carefully watched, constantly prevented from obtaining the drug, and medicine and nourishment administered according to the indications. Depressed vitality, weak and inefficient circulation, gastric hyperacidity and catarrh, anorexia, nausea, vomiting, various peculiar pains, prostration, sleeplessness, and overwhelming craving for the drug can all be promptly dealt with.

The patient will require tonics, perhaps trional, chloral, hyoscyamus, or some other hypnotic to procure sleep; the hyperacidity of the stomach which not only distresses but also either precipitates or aggravates the insatiable craving for the accustomed drug, calls for the administration of an alkaline carbonate or bicarbonate, such as sodium bicarbonate.

The opium or morphine may be rapidly or very gradually reduced, according to the indications noted by frequent observations, such as are best provided for in an institution. The dosage may fluctuate, in the reduction process, according to the tolerance of the patient's nervous system to the shock of reduction. The final reductions are the least well borne, the system clinging tenaciously to every fraction of usual effect.

The patient should not know how much of the drug he is taking when the reduction is made or the drug altogether discontinued.

A hot bath, massage, rubbing the legs with alcohol and ether, the use of bromides, gentian, nuxvomica, strychnine, digitalis, quinine, extract of coca, and coffee are among the beneficial measures to be employed; chloralamid and even codeine may be required. Fresh air and a fair amount of exercise in the convalescent part of the treatment, and a healthful occupation of the mind throughout, are important points. Every case is to a certain extent a law unto itself and will call for the physician's highest skill and persistent patience. Relapses, which may prove permanent, are apt to occur, even after long abstinence perhaps extending over years.

Berkley says:

"Comparatively few Morphine habitués are ever broken of their slavery to the alkaloid, and many that recover under treatment relapse in the course of a few months. Especially difficult to treat are those patients who have superadded *Cocaine* or *Alcohol* to the original habit, the combinations inducing new trains of symptoms even more difficult to combat than those from Morphine alone." * * *
"Not more than ten per cent. of all cases permanently recover; the remainder relapse within a few months."

PARALDEHYDE — CHRONIC PARALDEHYDE POISONING.

SYMPTOMS:

Constipation, flatulence, muscular weakness, tremors, restlessness, feeble, unsteady gait, insomnia, anxiety, discontent, unreasonableness, deficient memory, difficult speech, delusions, hallucinations of sight and hearing, irregular heart action, anæmia and emaciation are the chief symptoms.

TREATMENT:

Discontinuance of the drug, with quieting and tonic treatment are, as a rule, promptly effective in establishing a cure.

PHOSPHORUS — CHRONIC PHOSPHORUS POISONING.

Phosphorus may produce necrosis of the jaw from a periostitis resulting from the slow and continuous action of phosphorus. The periostitis, as a rule, spreads from decayed teeth. The lower jaw is, generally, the one affected.

The remedy for such necrosis is surgical.

SULPHONAL — TRIONAL — CHRONIC SULPHONAL POISONING — CHRONIC TRIONAL POISONING.**HISTORY:**

Chronic poisoning by sulphonal or trional are invariably the result of the daily taking of one or the other drug to produce sleep.

SYMPTOMS:

The symptoms are, in many respects, similar. Chief among these are noted frequently, disturbance of digestion, nausea, vomiting, constipation or diarrhoea, noises in the ears, headache, vertigo, mental and physical incapacity, difficulty of speech, unsteadiness of gait, sometimes more or less paralysis, great emaciation, etc.

TREATMENT:

The treatment consists of a discontinuance of the drug, rest, a carefully regulated diet, tonics, massage, etc.

WORMWOOD — ABSINTHE — ABSINTH-ISM.

HISTORY:

Wormwood combined with alcohol and sometimes adulterated with other noxious substances, and in either case known as absinthe, is an intense poison, rather than a tonic and aid to digestion as many suppose.

Absinthe, so freely used in France, particularly in Paris, and increasingly in other parts of Europe, is undoubtedly one of the greatest curses of the French nation.

A reckless absinthe mania is said to pervade both rich and poor classes. The craving for the draught is most intense, the poison becoming almost an absolute necessity of existence. Its effects on the human brain are very serious.

An alcoholic infusion of wormwood with other plants may be distilled to produce absinthe or as is now more commonly done, alcohol is added to various herb essences with essence of wormwood. (The liquer is also said to be an alcoholic solution of oil of wormwood with a little angelica, anise, and marjoram).

SYMPTOMS:

Absinthe reduces the gastric juice, interferes with digestion and produces a most distressing dyspepsia. The drug is said to produce its effect mainly on the cervical portion of the spinal cord. There is nocturnal restlessness and morning nausea and vomiting; the tongue and hands tremble, there is blindness, stupor, headache, apathetic listlessness. epileptiform convulsions, unconsciousness, falling, foaming at the mouth and throwing the limbs about, etc.

The alcohol of the absinthe relaxes, the wormwood tightens, so that the action of the former is succeeded by that of the latter. Alcohol produces coldness which absinthe increases, so that nervous

chills, unnatural coldness, trembling, nausea and staggering may result from drinking absinthe.

The alcohol has paralyzed the inhibitory power so that the voluntary muscles, urged by the absinthe and unrestrained and uncontrolled, are forced into convulsions of an epileptic character associated with complete unconsciousness. A repetition of the absinthe effect during the alcoholic relaxation is apt to result in confirmed epilepsy. It is said that "the characteristic phenomena of absinthecum—alcohol inebriety—are the epileptic explosion, vertigo, and early delirium." It is also said that "the more concentrated the poison the more pronounced is its local gastric causticity, alcohol being an irritant as well as a narcotic poison." If the poison be freely diluted with water it is more rapidly and completely absorbed, consequently increasing the other toxic properties.

The fascination which absinthe has for the absinthe drinker is intense. Perhaps the mental effect of his indulgence is a sufficient explanation of this. Under its influence he may believe himself to be a participant in the most momentous affairs. A panorama of battling hosts, raging elements, scenes of unrestrained revelry, of the transit of worlds of indescribable beauty and brightness, etc., passes swiftly before his distorted vision. He is lost in admiration and ecstasy, or overwhelmed with the intensity of stormy passions. He lives in another realm, and revels in it. He may be afflicted with terrifying hallucinations.

TREATMENT:

Although some claim that absinthism may be cured by discontinuing the poison and building up the nervous system, there can be no question but that the habit has an exceedingly strong hold upon its victim, greatly injures him, and that it is very difficult to permanently discontinue it.

APPENDIX.

DOSE TABLE.

Showing the **Minimum** and **Maximum Doses** of the Principal and Many New Remedies.

(This table is the result of the author's comparing and averaging the doses stated by the leading American and European authorities).

NOTE 1.—Approximate reduction to Metric doses may be obtained by multiplying Grains or Minims by $6\frac{1}{2}$, giving Centigrams; by multiplying Drachms by 4, giving Grams; by multiplying Ounces by 31, giving Grams. It is customary to count 8 teaspoonfuls to the ounce, especially when a graduated medicine glass is used.)

NOTE 2.—The following signs are used to confirm large doses intended to be prescribed in a prescription (2 grains are taken as an example) :

By underscoring thus: gr. ij or thus: gr. ii.

By emphasis after, thus: gr. ij ! or !!!

By spelling out the quantity: gr. ij two grains.

By writing after the quantity: gr. ij correct dose.

By writing after the quantity: gr. ij large dose intended.

NOTE 3.—Dr. Young's Rule for finding the fractional adult dose for a child:—

Divide the age by the age plus 12. Thus a child 3 years of age should get $\frac{3}{3+12} = \frac{1}{5}$ of the adult dose.

For children the doses of narcotics should be still smaller and of purgatives larger. At the age of 20 or 21 years the full dose of a medicine is given.

The hypodermatic dose is about $\frac{1}{2}$ that by the mouth. The rectal or vaginal dose about twice that by the mouth.

Author's Rule for child less than one year old:

For his own convenience, the author has devised the following rule, to determine the proportionate dose for a child less than one year old:—To the number of months the child lacks of being one year old add 12, to form the denominator of a fraction the numerator of which shall be 1 (the figure of the full year). This fraction may be considered to indicate the **approximate fractional part of the adult dose** suitable to the required age.

EXAMPLE.—Age 3 months, which is 9 months less than 1 year:

$\frac{1}{9+12} = \frac{1}{21}$ of adult dose.

At birth the dose should be usually about one-half that computed by this method.

For some of the **NEWEST** remedies, the author, after careful review, has adopted the doses recommended by Merck & Co., for the excellent products they manufacture.

APPORTIONATE DOSE TABLE.

From 20 to 60 years of age	give full dose;
From 60 to 80	" " $\frac{3}{4}$ to $\frac{2}{3}$ full dose;
From 80 to 100	" " $\frac{2}{3}$ to $\frac{1}{2}$ "
From 14 to 20	" " $\frac{3}{4}$ "
At 14 years of age	give $\frac{2}{3}$ full dose;
At 12	" " $\frac{1}{2}$ "
At 8	" " 2-5 "
At 6	" " $\frac{1}{3}$ "
At 4	" " $\frac{1}{4}$ "
At 3	" " 1-5 "
At 2	" " 1-7 "
At 1	" " 1-12 "
At 6 months of	" " 1-16 "
At 3	" " 1-20 "
At birth	give 1-60 to 1-30 "

DOSE TABLE.

REMEDY.	DOSE.	
	Minimum.	Maximum.
Absinthin	15 to	30 gr.
Acetal	$1\frac{1}{2}$ to	3 dr.
Acetanilidum	2 to	10 gr.
Acetonum	5 to	15 min.
Acetum Opii [Black Drop (E)]	5 to	15 min.
Acidum Agaricicum	1-12 to	$\frac{1}{2}$ gr.
Arsenosum	1-60 to	1-10 gr.
Benzoicum	5 to	30 gr.
Boricum	5 to	30 gr.
Camphoricum	10 to	30 gr.
Carbolicum	$\frac{1}{4}$ to	3 min.
Catharticum	4 to	5 gr.
Chrysophanicum	$\frac{1}{8}$ to	10 gr.
Citricum	5 to	30 gr.
Fluoricum Dilutum	15 to	20 min.
Gallicum	5 to	30 gr.
Gynocardicum	$\frac{1}{2}$ to	3 gr.
Hydrobromicum Dilutum	$\frac{1}{2}$ to	2 dr.
Hydrochloricum Dilutum	5 to	30 min.
Hydrocyanicum Dilutum	1 to	5 min.
Hypophosphorosum Dilutum (10 per cent.)	10 to	30 min.
Lacticum	15 to	30 gr.
Nitricum Dilutum	5 to	30 min.

REMEDY.	DOSE.	
	Minimum.	Maximum.
Acidum Nitrohydrochloricum.....	1 to	10 min.
Dilutum	5 to	20 min.
Oxalicum	$\frac{1}{4}$ to	1 gr.
Phosphoricum Dilutum	5 to	30 min.
Picricum	$\frac{1}{2}$ to	5 gr.
Salicylicum	5 to	30 gr.
Sulphuricum Aromaticum.....	5 to	15 min.
Dilutum	5 to	20 min.
Tannicum	1 to	20 gr.
Tartaricum	10 to	30 gr.
Valerianicum	2 to	10 min.
Aconitina (Potent., Cryst.).....	1-650 to	1-200 gr.
(Mild Amorph.)	1-60 to	1-20 gr.
Duquesnel	1-400 to	1-100 gr.
Aconitinæ Nitræ	1-500 to	1-250 gr.
Adonidin	1-16 to	$\frac{1}{4}$ gr.
Aether	5 to	60 min.
Hydrobromicus	10 to	60 min.
Agaricin	$\frac{1}{4}$ to	1 gr.
Agathinum	5 to	10 gr.
Alantol (Inulol)	1-6 to	$\frac{1}{2}$ gr.
Allyl Tribromidum	3 to	8 min.
Aloe Purificata	1 to	5 gr.
Aloinum	1 to	3 gr.
Alumini Hydras	3 to	15 gr.
Aminiformum (Urotropin. Formin).....	5 to	20 gr.
Ammonii Arsenas	1-20 to	1-12 gr.
Benzoas	5 to	15 gr.
Bromidum	5 to	30 gr.
Carbonas	3 to	15 gr.
Chloridum	1 to	20 gr.
Iodidum	2 to	10 gr.
Phosphas	5 to	20 gr.
Picras	$\frac{1}{8}$ to	$\frac{1}{2}$ gr.
Salicylas	2 to	20 gr.
Valerianas	1 to	5 gr.
Ammonol (Ammonium Phenyl Acetamid).. Salicylas	3 to 4 to	20 gr. 8 gr.
Amyl Nitris	$\frac{1}{4}$ to	1 min.
Amyleni Hydras	15 to	90 min.
Amylum Iodatum	3 to	30 gr.
Analgen	2 to	15 gr.
Anarcotina (Narcotin)	1 to	3 gr.

REMEDY.	DOSE.	
	Minimum.	Maximum.
Anemonin	$\frac{1}{8}$ to	$\frac{3}{4}$ gr.
Antifebrin	2 to	10 gr.
Antikamnia	4 to	10 gr.
Antikol	3 to	10 gr.
Antimonii et Potassii Tartras.....	1-20 to	$\frac{1}{8}$ gr.
Oxidum	1 to	2 gr.
Sulphidum Purum	$\frac{1}{4}$ to	1 gr.
Antimonium Sulphuratum	1 to	2 gr.
Antipyrinum (Phenazonum, B. P.).....	2 to	20 gr.
Antisepsin (Asepsin)	3 to	10 gr.
Antispasmin	$\frac{1}{4}$ to	2 gr.
Antithermin	3 to	8 gr.
Antitoxin (Diphtheria)	5 to	10 cc.
Apiolinum	$1\frac{1}{2}$ to	3 gr.
Apiolum	2 to	10 min.
Apiolum (Cryst.)	4 to	15 gr.
Apocodeinæ Hydras	3 to	4 gr.
Hydrochloras	1 to	$1\frac{1}{4}$ gr.
Apocynin	$\frac{1}{4}$ to	$\frac{1}{2}$ gr.
Apolysin	1 to	30 gr.
Apomorphinæ Hydrochloras	1-10 to	1-6 gr.
(Hypodermically)	1-30 to	1-10 gr.
Aqua Ammoniaë	5 to	30 min.
Creosoti	1 to	4 dr.
Laurocerasi	5 to	30 min.
Arbutin	2 to	15 gr.
Arecolin	1-20 to	1-16 gr.
Argenti Cyanidum	1-60 to	1-20 gr.
Iodidum	$\frac{1}{4}$ to	1 gr.
Nitras	$\frac{1}{8}$ to	$\frac{1}{2}$ gr.
Oxidum	$\frac{1}{2}$ to	2 gr.
Arsenauro	5 to	15 min.
Arseni Bromidum	1-60 to	1-20 gr.
Iodidum	1-20 to	1-12 gr.
Asaprol	3 to	10 gr.
Asparagin	3 to	10 gr.
Aspidosperminæ Hydrochloras.....	1-50 to	1-30 gr.
Sulphas	1-30 to	1-10 gr.
Aspirin	3 to	15 gr.
Atropina	1-120 to	1-60 gr.
Atropinæ Sulphas	1-120 to	1-60 gr.
Auri Bromidum	1-10 to	1-50 gr.
Auri et Sodii Chloridum.....	1-30 to	1-10 gr.

REMEDY.	DOSE.	
	Minimum.	Maximum.
Balsamum Gurjunæ	10 to	50 min.
Baptisin	$\frac{1}{2}$ to	5 gr.
Barii Chloridum	1-10 to	1 gr.
Sulphidum	$\frac{1}{2}$ to	1 gr.
Benzanilidum	10 to	15 gr.
Benzolinum	3 to	10 gr.
Benzonaphtol	4 to	8 gr.
Benzosol (Benzol-guaiacol, Guaiacol-benzoas)	3 to	15 gr.
Berberina	1 to	10 gr.
Berberinæ Hydrochloras	1 to	10 gr.
Beta-Naphtol	3 to	6 gr.
Betol	5 to	8 gr.
Bismuthi Benzoas	5 to	15 gr.
Benzonaphtolas	15 to	30 gr.
Beta-Naphtolas (Orphol)	5 to	15 gr.
Carbolas (Phenol Bismuth)	5 to	15 gr.
Lactas	5 to	15 gr.
Oxyiodidum (Subiodidum)	5 to	15 gr.
Salicylas	5 to	15 gr.
Subcarbonas	5 to	60 gr.
Subgallas (Dermatol)	5 to	15 gr.
Subnitras	5 to	60 gr.
Tannas (Bismuthan)	5 to	30 gr.
Blennostasin	1 to	4 gr.
Bromalin	30 to	60 gr.
Bromoformum	1 to	10 min.
Bromol	1 to	2 gr.
Brucina	1-12 to	$\frac{1}{2}$ gr.
Bryonin	1-6 to	2 gr.
Butyl-Chloral Hydras (Croton Chloral)....	5 to	10 gr.
Caffeina	1 to	5 gr.
Citrata	1 to	10 gr.
Effervescens	1 to	2 dr.
Caffeinæ Hydrobromas	$\frac{1}{2}$ to	2 gr.
Hydrochloras	1 to	5 min.
Salicylas	1 to	3 gr.
Sodio-Benzoas	2 to	10 gr.
Sodio-Salicylas	2 to	10 gr.
Tri-iodidum	1 to	4 gr.
Valerianas	1 to	3 gr.
Calcii Bromidum	5 to	30 gr.
Chloridum	5 to	20 gr.

REMEDY.	DOSE.	
	Minimum.	Maximum.
Calcii Glycerophosphas.....	2 to	5 gr.
Iodidum	1 to	3 gr.
Lactas	3 to	6 gr.
Lactophosphas	3 to	10 gr.
Phosphas Præcipitatus	8 to	20 gr.
Calx Chlorata	3 to	6 gr.
Sulphurata	1-10 to	1 gr.
Cambogia	1 to	4 gr.
Camphora	1 to	10 gr.
Monobromata	1 to	10 gr.
Salicylata	$\frac{1}{3}$ to	3 gr.
Cannabina (alkaloid)	1 to	4 gr.
Cannabinæ Tannas	2 to	10 gr.
Cannabinon	$\frac{1}{2}$ to	1 gr.
Capsicin	$\frac{1}{8}$ to	$\frac{1}{4}$ gr.
Capsicum	1 to	5 gr.
Carbo Animalis Purificatus.....	10 to	60 gr.
Ligni	10 to	60 gr.
Cascarine	2 to	3 gr.
Castoreum	10 to	50 gr.
Caulophyllin (resinoid)	$\frac{1}{2}$ to	2 gr.
Cerii Oxalas	1 to	5 gr.
Chinoidinum	1 to	30 gr.
Chinol	3 to	5 gr.
Chinolinæ Tartras	5 to	20 gr.
Chloral	5 to	20 gr.
Chloralose	3 to	10 gr.
Chloralamidum	10 to	40 gr.
Chloral-Antipyrin (Hypnal)	15 to	30 gr.
Chloral-Caffeina	3 to	7 gr.
Chloretone	5 to	20 gr.
Chlorodyne	5 to	30 min.
Chloroformum	2 to	10 min.
Chrysarobinum	1-60 to	1-12 gr.
Cimicifugin	1 to	3 gr.
Cinchonina	1 to	30 gr.
Cinchoninæ Salicylas	1 to	30 gr.
Sulphas	1 to	30 gr.
Cinchonidinæ Sulphas	1 to	30 gr.
Citrophen	3 to	15 gr.
Cocainæ Hydrochloras	$\frac{1}{8}$ to	2 gr.
Salicylas	$\frac{1}{8}$ to	2 gr.
Codeina	$\frac{1}{2}$ to	1 gr.

REMEDY.	DOSE.	
	Minimum.	Maximum.
Codeinæ Phosphas	$\frac{1}{8}$ to	$\frac{3}{4}$ gr.
Sulphas	$\frac{1}{4}$ to	1 gr.
Valerianas	$\frac{1}{4}$ to	1 gr.
Colchicin	1-120 to	1-30 gr.
Colocynthin	1-20 to	1 gr.
Coniina	1-60 to	1-30 gr.
Convallamarin	$\frac{1}{4}$ to	1 gr.
Convallarin	2 to	4 gr.
Convolvulin	1 to	2 gr.
Cornutin (Ecboline)	1-20 to	1-10 gr.
Cotoin	$\frac{1}{2}$ to	5 gr.
Creatinum	1 to	1 $\frac{1}{2}$ gr.
Creolin	$\frac{1}{2}$ to	5 gr.
Creosotal (Creosote Carbonate)	3 to	15 min.
Creosotum	1 to	3 min.
Cupri Acetas	$\frac{1}{8}$ to	1 gr.
Arsenas	1-130 to	1-100 gr.
Sulphas	$\frac{1}{4}$ to	10 gr.
Daturina	1-150 to	1-50 gr.
Daturinæ Sulphas	1-150 to	1-50 gr.
Digitalin, German (Merck)	1-16 to	$\frac{1}{2}$ gr.
Digitoxin	1-250 to	1-120 gr.
Dionin (Ethyl-Morphine Hydrochlor.)	$\frac{1}{4}$ to	1 gr.
Diuretin (Theobromin Sodio-Salicylate)	5 to	20 gr.
Duboisinæ Sulphas	1-100 to	1-60 gr.
Duotal (Guaiacol Carbonate)	5 to	15 gr.
Elaterinum	1-60 to	1-12 gr.
Elaterium	1-10 to	$\frac{1}{2}$ gr.
Emetina, Expectorant	1-120 to	1-60 gr.
Emetic	$\frac{1}{8}$ to	$\frac{1}{4}$ gr.
Eosote	3 to	5 gr.
Ergotinum, Bonjean	2 to	8 gr.
Ergotole, by mouth	5 to	30 min.
Hypodermic	5 to	20 min.
Eserina (Physostigmin)	1-200 to	1-60 gr.
Eucalyptol	1 to	15 gr.
Eudoxin	5 to	8 gr.
Euonymin	$\frac{1}{2}$ to	3 gr.
Euphorin	$\frac{1}{2}$ to	3 gr.
Euquinin (Euchinin)	1 to	30 gr.
Exalgine	1 to	3 gr.
Extractum Aconiti	$\frac{1}{8}$ to	$\frac{1}{8}$ gr.

REMEDY.	DOSE.	
	Minimum.	Maximum.
Extractum Aconiti Fluidum	$\frac{1}{2}$ to	2 min.
Ailanthi Fluidum	10 to	60 min.
Aloes Aquosum	$\frac{1}{2}$ to	3 gr.
Apocyni Fluidum	5 to	20 min.
Baptisæ Fluidum	2 to	10 min.
Belladonnæ Foliorum Alcoholicum....	1-10 to	$\frac{1}{2}$ gr.
Fluidum	3 to	6 min.
Radicis	$\frac{1}{8}$ to	$\frac{1}{4}$ gr.
Fluidum	1 to	3 min.
Berberis Vulgaris Fluidum.....	5 to	30 min.
Boldi Fluidum	1 to	5 min.
Buchu Fluidum	10 to	60 min.
Cacti Grandiflora Fluidum.....	5 to	10 min.
Cannabis Indicæ	$\frac{1}{8}$ to	1 gr.
Fluidum	5 to	10 min.
Cinæ Fluidum	15 to	60 min.
Colchici Radicis	$\frac{1}{2}$ to	3 gr.
Fluidum	2 to	5 min.
Seminis Fluidum	1 to	5 min.
Colocynthis	$\frac{1}{2}$ to	2 gr.
Conii	1 to	2 gr.
Fluidum	2 to	5 min.
Convallariæ Fluidum	1 to	15 min.
Digitalis	$\frac{1}{8}$ to	$\frac{1}{2}$ gr.
Fluidum	1 to	3 min.
Ergotæ	$\frac{1}{2}$ to	8 gr.
Fluidum	15 to	60 min.
Euonymi	1 to	5 gr.
Gelsemii Alcoholicum	$\frac{1}{4}$ to	$\frac{1}{2}$ gr.
Fluidum	1 to	5 min.
Glandulæ Suprarenales	3 to	8 gr.
Guaranæ Fluidum	10 to	30 min.
Hyoscyami Alcoholicum	1 to	3 gr.
Fluidum	3 to	10 min.
Ignatiæ	$\frac{1}{4}$ to	$\frac{1}{2}$ gr.
Jambolanum Fluidum	10 to	20 min.
Nucis Vomicae	$\frac{1}{8}$ to	$\frac{1}{2}$ gr.
Fluidum	1 to	5 min.
Opii	$\frac{1}{8}$ to	1 gr.
Passifloræ Fluidum	5 to	10 min.
Physostigmatis	1-16 to	$\frac{1}{8}$ gr.
Fluidum	1 to	3 min.
Rhamni Purshianæ Fluidum.....	1 to	15 min.

REMEDY.	DOSE.	
	Minimum.	Maximum.
Extractum Rhois Toxicodendri Fluidum....	1 to	5 min.
Scillæ Fluidum	1 to	5 min.
Stramonii	1-6 to	½ gr.
Veratri Viridis Fluidum.....	1 to	5 min.
Viburni Prunifolii Fluidum.....	½ to	2 dr.
Febralgene	5 to	15 gr.
Fel Bovis Inspissatum	5 to	15 gr.
Purificatum	5 to	10 gr.
Ferratin	4 to	10 gr.
Ferri Albuminas	10 to	20 gr.
Arsenas	1-16 to	½ gr.
Benzoas	1 to	5 gr.
Bromidum	1 to	5 gr.
Citras	2 to	10 gr.
et Strychninæ Citras.....	1 to	3 gr.
Glycerophosphas	1 to	5 gr.
Iodidum	1 to	5 gr.
Lactas	1 to	3 gr.
Oxalas	1 to	2 gr.
Phosphas	5 to	10 gr.
Pyrophosphas	1 to	5 gr.
Salicylas	3 to	10 gr.
Subcarbonas	5 to	30 gr.
Sulphas	1 to	5 gr.
Exsiccatas	½ to	3 gr.
Valerianas	½ to	2 gr.
Ferropyrin	5 to	15 gr.
Ferrosomatose	15 to	60 gr.
Ferrum Dialysatum	10 to	30 min.
Reductum	1 to	5 gr.
Formin (Urotropin)	5 to	30 gr.
Fuchsin (Rosein)	1-10 to	3 gr.
Gelsemin (resinoid)	⅛ to	½ gr.
Gelsemina (alkaloid)	1-120 to	1-30 gr.
Gelseminæ Hydrochloras	1-120 to	1-30 gr.
Geosote (Guaiacol Valerianas)	2 to	10 min.
Glandulæ Prostatae, Sicc. Pulv.....	¼ to	2 gr.
Suprarenales Sicc. Pulv.....	1 to	3 gr.
Thymi (Thymus Gland).....	4 to	10 gr.
Thymi Sicc. Pulv.....	3 to	10 gr.
Glonoinum (Nitroglycerin)	1-200 to	1-50 min.
Guaiacol	½ to	2 min.
Benzoas (Benzosol)	3 to	15 gr.

REMEDY.	DOSE.	
	Minimum.	Maximum.
Guaiacol Carbonas (Duotal).....	5 to	15 gr.
Salicylas (Guaiacol Salol).....	5 to	15 gr.
Valerianas (Geosote)	2 to	10 min.
Guaiamar	5 to	20 gr.
Guaiaperol	4 to	20 gr.
Guaiaquin (Guaiacol Quinin Bisulphonas)..	1 to	5 gr.
Guaranin	1 to	5 gr.
Helonin	$\frac{1}{2}$ to	3 gr.
Hemalbumen	10 to	20 gr.
Hemogallol	5 to	20 gr.
Hemoglobin	$\frac{1}{2}$ to	2 gr.
Hemol	5 to	10 gr.
Heroina	1-12 to	1-6 gr.
Heroinæ Hydrochloras	1-12 to	1-6 gr.
Homatropinæ Hydrobromas	1-120 to	1-20 gr.
Hydrochloras	1-120 to	1-20 gr.
Salicylas	1-120 to	1-20 gr.
Hydrargyri Chloridum Corrosivum.....	1-80 to	1-10 gr.
Mite	1-10 to	20 gr.
Cyanidum	1-100 to	1-10 gr.
Iodidum Flavum	1-6 to	1 gr.
Rubrum	1-50 to	1-10 gr.
Oxidum Rubrum	1-10 to	1-5 gr.
Salicylas	1-10 to	$\frac{1}{2}$ gr.
Subsulphas Flavum (Turpeth Mineral)	$\frac{1}{4}$ to	$\frac{1}{2}$ gr.
as emetic for child	2 to	3 gr.
Tannas	$\frac{1}{2}$ to	2 gr.
Thymol-Acetas	1-12 to	1-6 gr.
Hydrargyrum cum Creta (Gray Powder)..	$\frac{1}{2}$ to	10 gr.
Hydrastin (resinoid, eclectic).....	5 to	10 gr.
Hydrastina (alkaloid)	1-16 to	$\frac{1}{2}$ gr.
Hydrastinæ Sulphas	1-16 to	$\frac{1}{2}$ gr.
Hydrastinina	1-16 to	1-6 gr.
Hydrastininæ Hydrochloras	1-16 to	1-12 gr.
Hydrochinonum (Hydroquinone).....	5 to	30 gr.
Hyoscina	1-120 to	1-60 gr.
Hyoscinae Hydriodidum	1-120 to	1-60 gr.
Hydrobromas	1-120 to	1-60 gr.
Hydrochloras	1-120 to	1-60 gr.
Hyoscyamin (resinoid, amorphous).....	$\frac{1}{8}$ to	$\frac{1}{4}$ gr.
Hyoscyamina (alkaloid, cryst.).....	1-120 to	1-60 gr.
Hyoscyaminæ Hydrobromas	1-120 to	1-60 gr.
Sulphas	1-120 to	1-60 gr.

REMEDY.	DOSE.	
	Minimum.	Maximum.
Hypnacetin	3 to	4 gr.
Hypnal	15 to	30 gr.
Hypnone	1 to	7 gr.
Ichthalbin	5 to	10 gr.
Ichthyol	3 to	10 gr.
Infusum Digitalis	1 to	4 dr.
Infusum Sennæ Comp. (Black Draught)...	1 to	3 oz.
Iodipin	15 to	60 min.
Iodocaffein	2 to	5 gr.
Iodoformum	1 to	3 gr.
Iodol	½ to	3 gr.
Iodothyrim (Thyreim)	5 to	10 gr.
Ipecacuanhæ	1-6 to	30 gr.
Iridin	1 to	3 gr.
Jalapa	10 to	20 gr.
Juglandin	1 to	5 gr.
Kairin	3 to	15 gr.
Kalagua	¼ to	5 gr.
Kryofine	4 to	12 gr.
Lactophenine	8 to	15 gr.
Largin	5 to	8 gr.
Liquor Acidi Arsenosi	3 to	5 min.
Arseni et Hydrarg. Iodidi (Donovan's Sol.)	2 to	10 min.
Ferri Chloridi	2 to	10 min.
Iodi Compositus (Lugol's Solution)....	1 to	10 min.
Morphinæ Bimeconatis	5 to	40 min.
Opii Compositus (Squibb)	3 to	20 min.
Potassæ	5 to	30 min.
Potassii Arsenitis (Fowler's Solution).	1 to	8 min.
Sodii Arsenas	1 to	8 min.
Lithii Benzoas	5 to	15 gr.
Bromidum	5 to	20 gr.
Carbonas	2 to	10 gr.
Citras	2 to	5 gr.
Iodidum	1 to	8 gr.
Salicylas	5 to	30 gr.
Lobelin	½ to	1 gr.
Lupulinum	5 to	10 gr.
Lycetol	15 to	30 gr.
Lysidin	1 to	5 gr.
Massa Ferri Carbonatis	3 to	5 gr.
Hydrargyri	1 to	10 gr.
Magnesii Glycerophosphas	2 to	5 gr.

REMEDY.	DOSE.	
	Minimum.	Maximum.
Malakin	5 to	10 gr.
Malarin	5 to	15 gr.
Mangani Dioxidum (Bin oxide, Peroxide) ..	2 to	5 gr.
Hypophosphis	10 to	20 gr.
Sulphas	2 to	5 gr.
Menthol	3 to	5 gr.
Methyl Salicylas	5 to	10 min.
Methylal	2 to	5 min.
Methylene Blue	1 to	8 gr.
Migrainin	2 to	15 gr.
Morphina	1-20 to	$\frac{1}{2}$ gr.
Morphinæ Acetas	1-20 to	$\frac{1}{2}$ gr.
Hydrochloras	1-20 to	$\frac{1}{2}$ gr.
Sulphas	1-20 to	$\frac{1}{2}$ gr.
Muscarina	1-30 to	2 gr.
Napellin	$\frac{1}{2}$ to	$\frac{3}{4}$ gr.
Naphtalinum	2 to	15 gr.
Narceina	1-6 to	1 gr.
Narceinæ Hydrochloras	1-6 to	1 gr.
Narcotina	2 to	15 gr.
Nepenthe	5 to	30 min.
Neurodin	5 to	10 gr.
Niccoli Bromidum	2 to	8 gr.
Nicotina	1-20 to	1-10 gr.
Nitroglycerinum	1-200 to	1-50 min.
Nosophen (Iodophen)	5 to	8 gr.
Nuclein	20 to	60 gr.
Oleoresina Aspidii	$\frac{1}{2}$ to	1 dr.
Capsici	$\frac{1}{4}$ to	1 min.
Piperis	$\frac{1}{4}$ to	1 min.
Oleum Amygdalæ Amaræ.....	$\frac{1}{4}$ to	1 min.
Anisi	1 to	5 min.
Anthemidis	2 to	10 min.
Cajuputi	1 to	5 min.
Cari	1 to	5 min.
Caryophylli	1 to	5 min.
Chenopodii	5 to	10 min.
Cinnamomi	1 to	5 min.
Copaibæ	1 to	15 min.
Erigerontis	1 to	10 min.
Gaultheriæ	3 to	20 min.
Hedeomæ	2 to	10 min.
Juniperi	5 to	20 min.

REMEDY.	DOSE.	
	Minimum.	Maximum.
Oleum Lavandulæ Florum.....	1 to	5 min.
Menthæ Piperitæ	1 to	5 min.
Phosphoratum	1 to	3 min.
Rutæ	1 to	5 min.
Sabinæ	1 to	5 min.
Santoli	5 to	30 min.
Sinapis Volatile	$\frac{1}{8}$ to	$\frac{1}{4}$ min.
Tanaceti	1 to	3 min.
Terebinthinæ	5 to	60 min.
Tiglli	$\frac{1}{2}$ to	2 min.
Opii Pulvis	$\frac{1}{4}$ to	2 gr.
Opocerebrinum	3 to	6 gr.
Opohepatoidinum	5 to	10 gr.
Opohypophysinum	$\frac{1}{8}$ to	$\frac{3}{4}$ gr.
Opolieninum	$\frac{1}{2}$ to	1 $\frac{1}{2}$ dr.
Opomamminum	15 to	25 gr.
Opomedullinum	3 to	15 gr.
Opoorchidinum	8 to	12 gr.
Opoossiinum	3 to	15 gr.
Opoovariinum	3 to	12 gr.
Opopancreatinum	3 to	12 gr.
Opoprostatinum	1 to	3 gr.
Oporeniinum	8 to	12 gr.
Oposupranelinum	3 to	6 gr.
Opothymiinum	3 to	8 gr.
Opothyroidinum	$\frac{3}{4}$ to	1 $\frac{1}{2}$ gr.
Orexin	2 to	6 gr.
Orexinæ Tannas	2 to	8 gr.
Orthoform	5 to	15 gr.
Orphol	5 to	15 gr.
Oxycamphor	10 to	15 gr.
Papain (Papoid)	2 to	5 gr.
Papaverina	$\frac{1}{8}$ to	$\frac{1}{4}$ gr.
Papayotin	$\frac{1}{4}$ to	1 gr.
Paraldehydum	30 to	60 min.
Pelletierinæ Hydrobromas	4 to	8 gr.
Hydrochloras	4 to	8 gr.
Sulphas	5 to	10 gr.
Tannas	5 to	10 gr.
Pellotina	$\frac{1}{3}$ to	1 gr.
Pellotinæ Hydrochloras	$\frac{1}{2}$ to	1 $\frac{1}{2}$ gr.
Peptenzyme	10 to	20 gr.
Peronin	$\frac{1}{3}$ to	1 gr.

REMEDY.	DOSE.	
	Minimum.	Maximum.
Phenacetinum	5 to	20 gr.
Phenalgine	5 to	15 gr.
Pheno-Bromate	5 to	20 gr.
Phenocoll Hydrochloras	5 to	10 gr.
Salicylas (Salocoll)	3 to	30 gr.
Phenol-Bismuth (Bismuthi Carbolas).....	5 to	15 gr.
Phenolid	5 to	10 gr.
Phenosol	5 to	8 gr.
Phesin	8 to	15 gr.
Phloridzin (Phlorizin)	15 to	30 gr.
Phospho-Albumen	5 to	15 gr.
Phosphorus	1-120 to	1-50 gr.
Physostigmina (Eserin)	1-200 to	1-60 gr.
Physostigminæ Salicylas	1-120 to	1-60 gr.
Sulphas	1-120 to	1-60 gr.
Phytolaccin	1 to	3 gr.
Phytoline	5 to	15 min.
Picrotoxinum	1-60 to	1-20 gr.
Pilocarpinæ Hydrochloras	1-60 to	½ gr.
Piperazinum	5 to	10 gr.
Piperidin Guaiacolas	5 to	10 gr.
Piperinum	1 to	8 gr.
Plumbi Acetas	½ to	3 gr.
Iodidum	¼ to	½ gr.
Potassi Acetas	5 to	60 gr.
Arsenas	1-120 to	1-10 gr.
Bichromas	1-12 to	⅓ gr.
Bromidum	10 to	60 gr.
Carbonas	2 to	20 gr.
Chloras	2 to	20 gr.
Ferrocyanidum	5 to	10 gr.
Iodidum	2 to	30 gr.
Permanganas	½ to	3 gr.
Salicylas	5 to	15 gr.
Protopin	40 to	100 gr.
Pulvis Antimonialis (James' Powder).....	3 to	10 gr.
Elaterini Compositus	½ to	5 gr.
Ipecacuanhæ et Opii (Dover's Powder)	2 to	15 gr.
Jalapæ Compositus	10 to	60 gr.
Morphinæ Compositus (Tully's Powder)	5 to	15 gr.
Rhei Compositus (Gregory's Powder) ..	20 to	60 gr.
Quinidinæ Sulphas	1 to	30 gr.
Quininæ Arsenias	⅛ to	1 gr.

REMEDY.	DOSE.	
	Minimum.	Maximum.
Quininæ Bisulphas.....	1 to	20 gr.
Ferrocyanidum	5 to	10 gr.
Hydrobromas	1 to	20 gr.
Hydrochloras	1 to	20 gr.
Iodidum	1 to	5 gr.
Sulphas	1 to	20 gr.
Sulphocarbolas	1 to	6 gr.
Tannas	1 to	6 gr.
Valerianas	1 to	3 gr.
Salicylas	1 to	5 gr.
Resina Podophyllii	$\frac{1}{8}$ to	1 gr.
Resorcinum	2 to	10 gr.
Rubidii Bromidum	2 to	10 gr.
et Ammonii Bromidum.....	1 to	15 gr.
Iodidum	1 to	5 gr.
Saccharin (Glusidum, B. P.).....	2 to	5 gr.
Salacetol (Salantol)	20 to	30 gr.
Salfene	5 to	10 gr.
Salicinum	5 to	30 gr.
Saligenin	5 to	30 gr.
Salipyrin (Antipyrin Salicylas).....	5 to	30 gr.
Salocoll (Phenocoll Salicylas)	3 to	30 gr.
Salol	3 to	30 gr.
Salophen	5 to	20 gr.
Sanguinarina	1-12 to	$\frac{1}{2}$ gr.
Sanguinarinæ Nitras	1-12 to	$\frac{1}{2}$ gr.
Sulphas	1-12 to	$\frac{1}{2}$ gr.
Santoninum	1 to	5 gr.
Saponinum	$\frac{1}{2}$ to	2 gr.
Scoparin	$\frac{1}{2}$ to	1 gr.
Scopolaminæ Hydrobromas (Hypoderm.)..	1-250 to	1-60 gr.
Sodii Acetas	15 to	60 gr.
Arsenas	1-60 to	1-10 gr.
Benzoas	5 to	60 gr.
Bromidum	5 to	60 gr.
Glycerophosphas	3 to	10 gr.
Salicylas	5 to	30 gr.
Santonas	1 to	10 gr.
Sozoidolas	5 to	30 gr.
Sulphocarbolas	5 to	30 gr.
Sulphoichthyolas	3 to	10 gr.
Valerianas	1 to	5 gr.
Solanina	$\frac{1}{4}$ to	1 gr.

REMEDY.	DOSE.	
	Minimum.	Maximum.
Somnal	15 to	30 min.
Sparteinae Sulphas	1-10 to	$\frac{1}{2}$ gr.
Spiritus Aetheris Compositus.....	5 to	60 min.
Nitrosi	$\frac{1}{2}$ to	2 dr.
Ammoniae Aromaticus	15 to	60 min.
Camphorae	5 to	40 min.
Chloroformi	10 to	60 min.
Glonoini	1 to	3 min.
Strontii Bromidum	5 to	20 gr.
Iodidum	5 to	60 gr.
Salicylas	5 to	15 gr.
Lactas	1 to	10 gr.
Strophanthin	1-120 to	1-60 gr.
Strychnina	1-60 to	1-12 gr.
Strychninae Arsenas	1-60 to	1-12 gr.
Nitras	1-60 to	1-12 gr.
Sulphas	1-60 to	1-12 gr.
Syrupus Acidi Hydriodici.....	$\frac{1}{2}$ to	3 dr.
Allii	1 to	4 dr.
Ferri Iodidi	5 to	30 min.
Ipecacuanhae	$\frac{1}{4}$ to	6 dr.
Mangani Iodidi	10 to	30 min.
Scillae	30 to	60 min.
Compositus	10 to	30 min.
Sulphonal	10 to	40 gr.
Svapnia	$\frac{1}{2}$ to	3 gr.
Tannalbin	5 to	20 gr.
Tannigen	2 to	10 gr.
Tannopin (Tannone)	3 to	15 gr.
Terebenum	2 to	20 min.
Terpini Hydras	2 to	10 gr.
Terpinol	3 to	5 gr.
Tetronal	10 to	30 gr.
Thallin	$\frac{1}{2}$ to	8 gr.
Thallinae Sulphas	$\frac{1}{2}$ to	8 gr.
Tartras	$\frac{1}{2}$ to	8 gr.
Thebain	$\frac{1}{4}$ to	1 gr.
Theina (Hypoderm.)	1-6 to	1 gr.
Theobromin	5 to	15 gr.
Theobrominae Lithium Salicylas (Uro- pherin)	5 to	15 gr.
Sodio-Salicylas (Diuretin)	5 to	20 gr.
Thermol	3 to	6 gr.

REMEDY.	DOSE.	
	Minimum.	Maximum.
Thiocol	5 to	20 gr.
Thiol	2 to	10 gr.
Thymol	$\frac{1}{2}$ to	2 gr.
Thymus Gland	4 to	10 gr.
Dried, Powdered	3 to	10 gr.
Thyreoids	2 to	5 gr.
Thyroglandin	3 to	5 gr.
Tinctura Aconiti	$\frac{1}{2}$ to	15 min.
Fleming	$\frac{1}{2}$ to	2 min.
Ailanthi	10 to	120 min.
Baptisiæ	5 to	30 min.
Belladonnæ Foliorum	1 to	20 min.
Berberis Vulgaris	10 to	60 min.
Boldi	10 to	20 min.
Bryoniæ	5 to	30 min.
Cannabis Indica	5 to	30 min.
Cantharidis	1 to	20 min.
Capsici	10 to	30 min.
Catechu Composita	10 to	60 min.
Chloroformi Composita	20 to	60 min.
Cimicifugæ	5 to	60 min.
Colchici Seminis	10 to	60 min.
Conii	5 to	30 min.
Digitalis	5 to	30 min.
Gelsemii	5 to	15 min.
Hyoscyami	15 to	60 min.
Iodi	1 to	5 min.
Ipecacuanhæ	2 to	15 min.
Ipecacuanhæ et Opii (Liq'd Dover's Powd.)	2 to	15 min.
Lobelia	5 to	30 min.
Nucis Vomicæ	5 to	20 min.
Opii (Laudanum)	3 to	20 min.
Camphoratæ (child, 3 to 30 drops)	1 to	4 dr.
Compositus (Squibb)	$\frac{1}{2}$ to	1 dr.
Deodorata	3 to	20 min.
Physostigmatis	5 to	30 min.
Simuli	$\frac{1}{4}$ to	2 dr.
Stramonii	5 to	20 min.
Strophanthi	2 to	10 min.
Sumbul	5 to	60 min.
Veratri Viridis	3 to	10 min.
Tolysal (Tolypyrin Salicylas)	5 to	30 gr.
Tribromphenol Bismuth (Xeroform)	8 to	15 gr.

REMEDY.	DOSE.	
	Minimum.	Maximum.
Trimethylaminæ Hydrochloras	1 to	3 gr.
Tri-nitrinum. See Nitroglycerin.		
Trional	10 to	30 gr.
Triphenin	4 to	15 gr.
Tuberculin (Koch)	1-250 to	1-60 gr.
Tussol (Antipyrin Mandelate).....	1-20 to	8 gr.
Uranii Nitras	$\frac{1}{4}$ to	$\frac{1}{2}$ gr.
Urea	15 to	30 gr.
Urethanum	10 to	30 gr.
Uropherin	5 to	15 gr.
Urotropin (Aminoform)	5 to	30 gr.
Veratrin (resinoid)	$\frac{1}{8}$ to	$\frac{1}{2}$ gr.
Veratrina	1-60 to	1-10 gr.
Vinum Antimonii	1 to	10 min.
Colchici Radicis	5 to	20 min.
Seminis	10 to	30 min.
Ergotæ	1 to	4 dr.
Ipecacuanhæ	1 to	60 min.
Opii (Sydenham's Laudanum).....	3 to	20 min.
Xeroform (Tribromphenol Bismuth).....	8 to	15 gr.
Xylol	5 to	20 min.
Zinci Acetas	$\frac{1}{2}$ to	2 gr.
Bromidum	$\frac{1}{2}$ to	2 gr.
Cyanidum	1-10 to	1 gr.
Iodidum	$\frac{1}{2}$ to	2 gr.
Phosphidum	1-20 to	1-10 gr.
Sulphas	10 to	30 gr.
Sulphoichthyolas	$\frac{1}{2}$ to	1 gr.
Sulphocarbolas	1 to	4 gr.
Valerianas	$\frac{1}{2}$ to	3 gr.



TABLE OF MAXIMUM DAILY DOSES.

(TOTAL OF SAFETY IN 24 HOURS.) (ARRANGED FROM P. G., MERCK, ETC.)

MEDICINE.	In a Day. Grains.
Acetanilid.....	60
Acid, Arsenous.....	$\frac{1}{8}$
“ Carbolic.....	9
“ Hydrobromic, Dil.....	10 Drachms
“ Iodic.....	18
“ Valerianic.....	40 Drops
Adonidin.....	1
Agaricin.....	2
Aloin.....	10
Amylene Hydrate.....	120 M. +
Antifebrin.....	60
Apiol, crystallized (solid Parsley-camphor).....	60
Apocodeine.....	$1\frac{1}{8}$
Apomorphine Hydrochlorate.....	$\frac{3}{4}$
Asparagin.....	$4\frac{1}{2}$
Atropine Sulphate.....	$\frac{1}{16}$
Baptisin.....	20
Benzene (Benzol).....	180 M.
Berberine Hydrochlorate.....	45
Butyl-chloral Hydrate.....	60 +
Cannabine Tannate.....	40
Cannabinon.....	$4\frac{1}{2}$
Cerium Oxalate.....	15
Chrysarobin.....	$\frac{1}{4}$
Cocaine Hydrochlorate.....	6
Colocynthin.....	2
Coniine Hydrobromate.....	$\frac{1}{2}$
Convallamarin.....	5
Copper Arsenite.....	1
Cotoin.....	10
Creosote.....	15 M. +
Daturine.....	$\frac{1}{16}$
Digitalin (French) (Merck).....	$\frac{1}{16}$
Digitalis, Infusion.....	3 Ounces
“ Extract.....	12
“ Tincture.....	2 $\frac{1}{4}$ Drachms
Digitoxin.....	$\frac{1}{16}$
Duboisine.....	$\frac{1}{16}$
Euonymin (the pure Resinoid!).....	15
Fluid Extract: Boldo.....	45 M.
“ “ Golden Seal (Hydrastis).....	150 M.

TABLE OF MAXIMUM DAILY DOSES. (Continued).

MEDICINE.	In a Day. Grains.
Fluid Extract of Grindelia Robusta	300 M.
“ “ Kava-Kava (Piper Methysticum).....	30 M.
“ “ Lily of the Valley (Convallaria Majalis)	30 M.
“ “ Piscidia (Jamaica Dogwood).....	225 M.
Fuch sine.....	12
Gelseminine Hydrochlorate.....	$\frac{1}{4}$
Guaiacol	8 M. +
Guaiacol Carbonate	130+90
Homatropine Hydrobromate ; or Sulphate	$\frac{1}{30}$
Hydroquinone (Hydrochinone).....	30 +
Hyoscine Hydrochlorate.....	$\frac{1}{16}$ +
Hyoscyamine Sulphate.....	$\frac{1}{16}$ +
Hypnone (Aceto-phenone).....	23
Ichthyol	60
Iodine Trichloride.....	$1\frac{1}{4}$
Iodothyrene	40
Menthol.....	30+90
Mercury Bichloride.....	$\frac{1}{2}$
“ Cyanide.....	$\frac{1}{16}$
Methylene Blue (Medicinal).....	15
Naphtalene.....	90
Naphtol, Beta.....	30
Nickel Bromide	23
Nitroglycerine.....	$\frac{1}{16}$
Nux Vomica, Extract.....	3
Opium, Extract (aq.).....	5
Paraldehyde.....	3 Drachms
Pelletierine Sulphate ; or Tannate.....	75
Phenacetin.....	75
Picrotoxin.....	$\frac{1}{16}$
Piperin.....	18
Resorcin	150
Salol.....	150
Silver Cyanide	$\frac{1}{16}$
“ Iodide.....	2 +
Solanine.....	$7\frac{1}{2}$
Sparteine Sulphate.....	2
Strophianthin	$\frac{1}{30}$
Sulphonol.....	120
Terpin Hydrate	45
Terpinol	45
Thalline Sulphate.....	24
Tincture of Strophanthus.....	30 M.

+ Means dose may be developed higher.

DIRECTIONS FOR MAKING POST-MORTEM EXAMINATIONS.

(Witherstine).

In conducting post-mortem examinations, with a view either to pathological study or medico-legal investigation, *order* and *method* are of great importance.

The three great cavities—the HEAD, the CHEST, and the ABDOMEN—should always be examined, whether suspicion of disease in them exists or not. First, however (the autopsy being made from twelve to thirty-six hours after death), we should note the EXTERNAL APPEARANCE of the body—its *size*, *weight*, *conformation*, *color of the skin*, etc. (In cases of suspected violence, even abrasion should be minutely described.)

To examine the HEAD, an incision should be made through the scalp, across the top of the head, from ear to ear; the two flaps thus formed should be reflected, the one over the forehead, the other over the occiput. The nature of the attachment of the occipito-frontalis muscle to the bone beneath is such as to allow, very easily, the loosening of the scalp. The cranium (calvaria) is now to be removed by means of a small saw.

For the purpose of holding the head firmly during the use of the saw, Dr. T. A. Demme has furnished, as a substitute for the craniotome of Mr. Lund, of London, a *cranium-holder*, which enables the operator to make a section of the skull in any direction. It consists simply of a bar of iron, curved like the letter U, at each extremity of which two drill-screws are placed, which, when forced down upon the bone, holds the bar firmly *in situ*, and enables the examiner to control the head. The legs of the instrument, for use, are placed upon the lateral portions of the skull over the squamous portions of the temporal bones.

The section of the cranium with the saw should be made through its outer table completely around the head—from *before backward*, from below the frontal protuberances to the squamous portion of the temporal bone, and from *behind forward*, from the occipital protuberance to the squamous portion of the temporal bone, meeting the line just described. The shape of the piece thus cut out enables it to be maintained in its proper position when the parts are readjusted. It is removed by the aid of an elevator, or chisel and hammer, fracturing the inner table of the skull by strokes so applied as not to pierce the brain.

The dura-mater is next to be cut through, on each side of the superior longitudinal sinus; after which dividing the *falx cerebri*, the brain may be raised carefully with the hand placed under its anterior portion. The internal carotid artery and cranial nerves, etc., are now to be severed by the knife, and finally the vertebral arteries and spinal chord. The brain itself may then be taken out and inspected, by slicing it from the upper part downward, in successive horizontal layers.

To examine the SPINAL COLUMN, an incision should be made from the occipital protuberance to the extremity of the os occygis. The deep muscles of the back should then be loosened from their attachments so as to expose the laminæ and spinous processes of all the vertebræ. With the chisel and mallet, or saw, we must cut through the arches of the vertebræ on each side, close to their articular processes. After thus opening the spinal canal, the cord is to be exposed by dividing the dura-mater through its whole length.

To examine the NECK, an incision should be made through the skin, extending from above the hyoid bone to the upper part of the sternum. Avoiding penetration of the large veins of the neck, the parts to be examined may be carefully dissected, and, if desirable, removed from the body. The thyroid gland, larynx, and its appendages, tongue, pharynx, œsophagus, blood-vessels, and nerves of the neck, may be thus viewed.

To examine the CHEST, two incisions are desirable; the one from the root of the neck, in front, to the extremity of the ensiform cartilage; the other at right angles to this, across the middle of the thorax. The cartilages of the ribs are to be cut through at the lines of junction with the ribs. The ensiform cartilage, being drawn outward, is to be detached from the soft parts, the knife being held *close to the sternum*. The sterno-clavicular articulation may now be opened, and the sternum with the costal cartilages raised from its position, a cautious use of the knife being made to remove the adherent soft parts.

The thoracic viscera are now exposed, and may be drawn out with care and inspected in detail.

To examine the ABDOMEN, make a crucial incision; the one branch extending from the sternum to the pubes, passing to the left of the umbilicus; the other transversely across the middle of the abdomen. Care must be taken, in making these incisions, not to injure the subjacent viscera.

Before removing the stomach or any portion of the intes-

tines, ligatures should be placed above and below the part that is to be separated.

When—as is always desirable, if possible—both of the large cavities of the trunk are to be opened, a single incision, extending from the top of the sternum to the symphysis pubis, may be made.

In every case incisions through the skin should be made, as far as practicable, only in those parts which are usually covered by the clothes of the deceased. It is generally advisable, when the abdomen or thorax has been opened, to fill the cavities with bran or sawdust. After the examination has been completed, the edges of the divided integument should be brought together, and retained in apposition by the common continued suture.

KEY TO URANALYSIS.

(FOR EXCLUSION PURPOSES IN TOXICOLOGICAL INVESTIGATIONS.)

FRESH NORMAL URINE: Amber-colored, transparent, aromatic odor, bitter saline taste, acid reaction, specific gravity, 1018 to 1022. Consists “chiefly of a solution of urea and certain organic and inorganic salts, holding in suspension epithelial cells and mucus.” Composition not constant, but influenced by amount of water and other fluids taken, by temperature of skin, by emotions, local or general blood pressure, by amount of work done, time of day, age, sex, medicine, etc. (Condensed from Bartley.)

CLEAR LIQUID PORTION OF URINE.

(Adapted by the author.)

If urine dark colored and specific gravity high, it indicates urea, uric acid or blood; if urine light colored, indicates sugar. When specific gravity is more than 1025—

If gives crystals with nitric acid, indicates urea.

If gives reaction by Trommer's test or fermentation, indicates sugar.

If is neutral or feebly acid, precipitates on boiling and precipitate is soluble in nitric acid, indicates earthy phosphates. If this last precipitate is not soluble in nitric acid, indicates albumin.

If hydrochloric acid gives needle-shaped crystals, indicates hippuric acid.

If is high colored and boiling produces coagula, indicates blood.

If gives red color with hydrochloric acid, indicates excess of coloring matter. (Urorrhodin.)

If color changes upon adding nitric acid (iridescent), indicates bile.

URINARY DEPOSITS. (Bartley).

CHEMICAL EXAMINATION.

Draw off a portion of the sediment with a pipette or glass tube, and transfer to a watch-glass or small test-tube.

White Deposit.	{	Dissolves on heating urine	{	Sol. in NH_4OH , . . .	{	Ammonium urate.
		Insoluble on heating.		Insol. in NH_4OH , {		Soluble in acetic acid, Cystin. Earthy Phosphates. Insoluble in acetic acid, Calcium oxalate or oxalurate. Gelatinizes in NH_4OH , Pus (see above).

KEY TO URANALYSIS. (Continued.)

Colored Deposit.	{	Visibly crystalline (red),	<i>Uric acid.</i>
		Pale, easily soluble by heat,	<i>Urates</i>
{	Amorphous,	Deep-colored, slowly soluble by heat,	<i>Acid urates with uroerythrin.</i>
		Red, insoluble by heat, alkalies, or acids,	<i>Blood.</i>

MICROSCOPICAL EXAMINATION.

With a clean pipette draw off a small portion of the sediment, transfer to a clean glass slide, and examine with a $\frac{1}{2}$ -in. or $\frac{1}{4}$ -in. objective. A cover-glass may be dispensed with.

Deposit is Amorphous.	{	Small granules with spicules on larger granules; vanishes on adding KOH or NaOH	{ light = <i>Sodium urate.</i> dark = <i>Ammonium urate.</i>	
		Permanent on adding KOH or NaOH, Globules, strongly refracting light,		<i>Calcium carbonate</i> (rare). <i>Fat.</i>
Deposit is Crystalline.	{	Urine, { Yellow, cross or wheistone shaped, or in groups, <i>Uric acid.</i> Regular octahedra, envelope-shaped, . . . <i>Calcium oxlate.</i> Hexagonal plates, soluble in NH ₄ OH (white), . . <i>Cystin.</i> Bundles of needles crossing each other, . . . <i>Tyrosin.</i>		
		Alkaline Urine. { Large prisms, soluble in acetic acid (coffin-lid shaped), <i>Ammonium magnesium phosphate.</i> Brown, double spheres, spiculated, <i>Urate of ammonium.</i> Club-shaped crystals, single or in groups, <i>Calcium phosphate.</i> Double spheres, radiated structure soluble in acetic acid with effervescence, <i>Calcium carbonate</i> (rare). Double spheres, insoluble in acetic acid, <i>Calcium oxalurate</i> (rare). Double spheres, yellow or red, striated, . . <i>Uric acid.</i>		
Cellular Elements.	{	Red or yellow discs, biconcave; sometimes irregular in outline, <i>Blood-cells.</i>		
		Granulated corpuscles. With diluted acetic acid, show 3 to 5 nuclei,	{ Albumin present, <i>Pus.</i> Albumin absent, <i>Mucous corpuscles.</i>	
		Round, conical, or flat cells with one nucleus, <i>Epithelium from urinary tract.</i>		
		Tadpole-shape, with long tail (small), <i>Spermatozoa.</i> Cylinders, parallel margins, clear, granular, or containing, epithelial cells or blood-cells, . . . <i>Casts of uriniferous tubules.</i> Fungi, yeast, hairs, threads, etc., etc. . . <i>Extraneous matters.</i>		

ANTIDOTE BAG.

In addition to materials for an emergency uranalysis, an antidote bag should contain: the arsenic antidote in two solutions, chloroform, ether, magnesia, magnesium sulphate, old oil of turpentine, tannic acid, animal charcoal, zinc sulphate, copper sulphate, ipecacuanha, castor oil, acetic acid, chloral, potassium permanganate, solution of potash, hydrogen peroxide, saponin, tincture of aconite, amyl nitrite pearls, alcohol, brandy, aromatic spirit of ammonia, hypodermic tablets of pilocarpine nitrate, morphine sulphate, atropine sulphate, apomorphine hydrochlorate, strychnine sulphate, digitalin, nitroglycerine. A hypodermic syringe, stomach tube, mouth gag, tongue forceps, fountain syringe, infusion apparatus, catheter, etc.

TABLES.

APPROXIMATE MEASURES.

1 minim	varies from 1 to 2 drops;		
1 fluid drachm	equals about	1	teaspoonful (cochlear parvum);
2	" " "	1	dessertspoonful (cochlear medium);
4	" or		
$\frac{1}{2}$ fluid ounce	" "	1	tablespoonful (cochlear magnum);
2	" "	1	wineglassful (cyathus vinarius);
4	" "	1	small teacupful or gill; teacup (poculum);
6	" "	1	ordinary teacupful;
8	" "	1	coffee cupful ($\frac{1}{2}$ pt.), 1 tumblerful;
1 pint	" "	1	pound (of water); pound (libra);
2 pints	" "	1	liter or kilogram of water.

The number of drops in 20 minims of the following:

<i>Acids:</i>	DROPS.
Acetic	40
Hydrocyanic	15
Hydrochloric	18
Nitric Dilute.....	17
Sulphuric	30
Sulphuric Dilute.....	17
Aether	50
Fowler's Solution	19
<i>Oils:</i>	
Essential oils of vegetables.....	40
<i>Tinctures:</i> of all vegetables.....	40
<i>Vinegars</i>	26
<i>Water:</i>	
Distilled	15
Strong water of ammonia.....	18
Dilute water of ammonia.....	15
<i>Wines:</i>	
Of Antimony.....	24
Of Colchicum	25
Of Opium.....	26

Number of drops will also vary according to size of neck and flange of vessel from which the fluid is dropped.

APOTHECARIES WEIGHT.

20 grains make one scruple;
 3 scruples " drachm (60 grains);
 8 drachms " ounce (480 grains);
 12 ounces " pound (5760 grains).

1 lb. = 12 ounces = 96 drachms = 288 scruples = 5,760 grains
 1 ounce = 8 drachms = 24 scruples = 480 grains
 1 drachm = 3 scruples = 60 grains
 1 scruple = 20 grains

TROY WEIGHT.

24 grains make one pennyweight;
 20 pennyweights " ounce (480 grains);
 12 ounces " pound (5760 grains).

AVOIRDUPOIS WEIGHT.

1 lb. = 16 ounces = 256 drachms = 7,000 grains;
 1 ounce = 16 drachms = $437\frac{1}{2}$ grains;
 1 drachm = 27 $\frac{3}{10}$ grains.
 1 grain Troy = 97-100 grain Avoirdupois.

U. S. OR APOTHECARIES MEASURE.

	Pint.	Fluid ounce.	Fluid drachm.	Minim.
Gallon = 8 = fluid oz.	128 = fluid dr.	1024 = minim	61440;	
1 = fluid oz.	16 = fluid dr.	128 = minim	7680;	
fluid oz.	1 = fluid dr.	8 = minim	480;	
	fluid dr.	1 = minim	60.	

WEIGHT OF WATER.

At 60° F. the U. S. fluid ounce of distilled water weighs 455.7 grains. The British fluid ounce 437.5 grains.

WEIGHTS AND MEASURES OF VISCERA.

The following are said to be the average weights and measurements of the viscera in health. Some allowance must, of course, be made for extremes (either way) of height and weight. The measurements are in inches:

Heart—Adult, Male.	11 oz.	Usually about the size
Heart—Adult, Female.	9 oz.	of the closed fist (<i>i. e.</i> ,
		5 x $3\frac{1}{2}$ x $2\frac{1}{2}$ in.).

Brain—Adult Male	49½ oz.	{ Cuvier, 64 oz.
		{ Byron, 58 oz.
Brain—Adult Female.....	44 oz.	
Spinal Cord... 1 oz. to	1¾ oz.	(18 in. long.)
Liver.....	50 oz. to 60 oz.	(12 x 7 x 3 in.)
Pancreas.....	2¼ oz. to 3½ oz.	
Spleen.....	5 oz. to 7 oz.	
Lungs—Ad., Male (together)	45 oz.	
Lungs—Ad., Female “	32 oz.	
Stomach.....	4½ to 7 oz.	
(Moderately full, 12 in. horiz. x 4 in. vert. Holds 3 pints.)		
Thyroid body.....	1 oz. to 2 oz.	
Thymus at birth.....	½ oz.	
Kidneys, together	9 to 10 oz.	(Size, 4 x 2 x 1 in. each.)
Suprarenal capsules....	2 drachms.	
Prostate gland.....	6 drachms.	
Testicles, together....	¾ oz. to 1 oz.	
Unimpregnated uterus.	7 to 12 drachms.	(Size, 3 x 2 x 1 in.
or a little more.)		
1 line (written ") is 1-12 of an inch (written ').		

METRIC MEASURES.

LENGTH.

1 meter equals	39,368 inches.
1 decimeter equals	3.9368 inches.
1 centimeter equals39368 inch.
1 millimeter equals039268 of an inch.
1 decameter equals	393.68 inches.
1 hectometer equals	3,936.8 inches.
1 kilometer equals	39,368 inches.
1 myriameter equals.....	393,680 inches

WEIGHT.

1 gramme equals	15.434 grains.
1 decigramme equals	1.5434 grains.
1 centigram equals15434 of a grain.
1 decagramme equals	15.434 grains.
1 hectogramme equals	1,543.402 grains.

MEASURE.

1 litre equals 2.113 pints or	15,434 grains.
1 decilitre equals 3.381 fluid ounces or	1,543.4 grains.
1 centilitre equals 2.705 fluid drachms or	154.34 grains.
1 millilitre equals 16.231 minims or	15.434 grains.
1 decaliter equals 2 641 Cong's or	15,434 grains.
1 hectoliter equals 26.419 C. or	1,543,000 grains.
1 kiloliter equals 264.19 C.	
1 myrialiter equals 2,641.9 C.	

TEMPERATURE EQUIVALENTS.

1° Fahrenheit = 5-9° Centigrade = 4-9° Reaumer. To reduce F. to C., subtract 32 from F. degrees given and divide remainder by 1.8. To reduce C. to F. multiply C. degrees given by 1.8, and then add 32° to this.

PULSE TABLE.

Giving Average Frequency at Different Ages (in health).

In the foetus <i>in utero</i> ...	between 150 and 140 beats per minute
In new-born infants....	" 140 " 130 "
During 1st year.....	from 130 down to 115 "
" 2d "	" 115 " 100 "
" 3d "	" 105 " 95 "
From 7th to 14th year...	" 90 " 80 "
" 14th to 21st " ...	" 85 " 75 "
" 21st to 60th " ...	between 75 and 79 "
In old age.....	" 75 " 80 or more.

The pulse is, as a rule, more frequent *in females*, by 10—15 beats per minute; *during* and *after exertion*, unless long continued; *during digestion* or *mental excitement*; generally, more frequent *in the morning* than later in the day. It is temporarily accelerated after sudden change of posture from the recumbent to the sitting, and from either to the standing position especially during convalescence and in other states where the action of the heart is feeble.

RESPIRATION AT VARIOUS AGES.

	No. Resps. per Min.		No. Resps. per Min.
First year	35	At puberty	20
Second year	25	Adult age	18 to 20

INCOME AND EXPENDITURES OF LIFE.

Income.	Grains.	Expenditure.	Grains.
Solid food	8,000	Lungs give off.....	20,000
Water	37,650	Skin	11,750
Oxygen	13,000	Kidneys	24,100
		Intestines	2,800
Total	58,650		
		Total	58,650

"The body of a man weighing 148 pounds is made up as follows: Water, 90 pounds; living matter, 26 pounds; fat, 23 pounds; minerals, 8.3 pounds. Food must construct this frame and must repair whatever losses it sustains.

"Nitrogenous foods are obtained from the juice of meat, the white of egg, the curd of milk, the legumen of peas and beans and the gluten of bread. These foods build up the living parts of the body, the cells and tissues. The fats are heat and energy producers. Starches and sugars are energy-makers in a less degree. Minerals form bone and are used by the body in many ways. Water is the most important food."

POISONING FATALITIES.

Blyth says: Although so large a number of substances destroy life by accident or design, yet there are in the list only about 21 which kill about 2 persons or above each year. The 21 substances arranged in the order of their fatality are as follows:

IN ENGLAND

the following seems to be the order, 1851—1871:

Caustic potash	19
Poisonous fungi	23
Aconite	59
Mercury	60
Belladonna	76
Sulphuric acid	93
Ammonia	98
Chlorodyne	102
Alcohol	108
Arsenic	110
Chloroform	113
Vermin killer	127
Chloral	127
Phosphorus	155
Cyanide of potassium	166
Strychnine	201
Nitric acid	204
Prussic acid	260
Carbolic acid	762
Lead	1,043
Opiates	1,324

Suicidal Poisoning.—Poisons which kill more than one person suicidally each year are only 19 in number, as follows:

IN GERMANY. •

Deaths from suicide during the ten years ending 1892—

Potassic bichromate	10
Chloroform	14
Chloral	15
Chlorodyne	16
Aconite	19
Belladonna	20
Mercury	24
Nitric acid	27
Ammonia	34
Sulphuric acid	53
Arsenic	77
Phosphorus	84
Vermin killer	118
Prussic acid	122
Hydrochloric acid	138
Strychnine	150
Oxalic acid	200
Prussic acid	221
Opiates	281
Phenol	290

IN FRANCE.

The following seems to be the order there, 1851-71—

Arsenic	331
Phosphorus	301
Preparations of copper	183
The mineral acids	54
Cantharides	35
Strychnine	14
Opiates	12
Mercurial preparations	9
Antimonial preparations	6
Preparations of iron	5
Cyanides (that is, Prussic and Potassic Cyanide).	5

IMPORTANT FACTS.

Be cautious in giving atropia to flaxen-haired, light-complexioned, nervous women.

Be cautious in the use of morphia subcutaneously after opiates or morphia have been given by the mouth or rectum.

The healthy mucous membrane of the bladder never absorbs medicine; an ulcerated vesical mucous membrane does.

Children are especially susceptible to the narcotic action of opium and its alkaloids.

A catheter should never be *forced* into the bladder. All catheters should be kept perfectly clean. After each using they should be dipped in carbolized oil, washed in warm water, and, if gum elastic, be put away in zinc powder, powdered soapstone, or starch. All soft-rubber articles are rendered hard and brittle by contact with oil or grease. Catheters used in puerperal cases should be rendered thoroughly aseptic.

THE ORDER OF THE ERUPTION OF THE TEETH.

(An aid in determination of age.)

FIRST DENTITION.

As a rule the teeth of the lower jaw precede those of the upper, except in the case of the lateral incisors.

Central incisors	5th to 8th month.
Lateral incisors	7th to 9th month.
First molars	12th to 16th month.
Canines	16th to 20th month.
Second molars	20th to 36th month.

SECOND DENTITION.

First molars	5th to 7th year.
Central incisors	7th to 8th year.
Lateral incisors.....	8th to 9th year.
First bicuspid	9th to 10th year.
Second bicuspid	10th to 11th year.
Canines	11th to 12th year.
Second molars	12th to 13th year.
Third molars	17th to 21st year.

THE ERUPTIVE FEVERS.

(A table to aid in determining the source of eruption, in suspected, poisoning with eruption.)

Disease—Scarlet Fever (Scarlatina).

PERIOD OF INCUBATION. Four to seven days, or shorter.

MODE OF ONSET. Sudden; very often at night; sore throat; vomiting; convulsions in severe cases; high fever.

ERUPTION APPEARS.—At the end of the first or during the course of the second day.

ERUPTION FADES.—In three to five days; disappearing first where it first appears.

DANGER OF CONTAGION. As long as desquamation continues, or a purulent discharge from the ear or an abscess keeps up;

indefinitely in clothing, toys, books, etc., which have not been disinfected.

Disease—Measles (Morbilli, Rubeola).

PERIOD OF INCUBATION. Eight to ten days.

MODE OF ONSET. Rather sudden; catarrhal symptoms; moderate fever.

ERUPTION APPEARS. Fourth day; less commonly on the third or fifth.

ERUPTION FADES. In about four days.

DANGER OF CONTAGION. So long as the fine, branny desquamation lasts.

Disease—Rotheln (Rubella, German or French Measles).

PERIOD OF INCUBATION. Two or three weeks.

MODE OF ONSET. Gradual, fever slight and transient, sometimes absent.

ERUPTION APPEARS. The eruption usually the first symptom.

ERUPTION FADES. Irregularly; in about four to six days, without desquamation.

DANGER OF CONTAGION. The duration of the liability to communicate the disease is not known.

Disease—Smallpox (Variola).

PERIOD OF INCUBATION. Ten to fourteen days.

MODE OF ONSET. Sudden; chill; high fever; headache; pain in loins, etc.

ERUPTION APPEARS. On the third or fourth day; typical evolution, about the sixth day or the ninth of the disease characteristic pustules fully formed.

ERUPTION FADES. Desiccation at the end of second week; crusts slowly separate, leaving marked and enduring cicatrices.

DANGER OF CONTAGION. So long as crusts reform; indefinitely in fomites, etc.

Disease—Varioloid (Modified Smallpox).

PERIOD OF INCUBATION. Ten to fourteen days.

MODE OF ONSET. Sudden; chill; high fever; headache; pain in loins, etc.

ERUPTION APPEARS. On the third or fourth day; typical evolution, about the sixth day or the ninth of the disease characteristic pustules fully formed.

ERUPTION FADES. Pocks do not go on to suppuration, but begin to dry up from the vesicular stage, *i. e.*, the sixth or eighth day of the disease.

DANGER OF CONTAGION. So long as crusts reform; indefinitely in fomites, etc.

Disease—Chicken-pox (Varicella).

PERIOD OF INCUBATION. About two weeks.

MODE OF ONSET. Sudden.

ERUPTION APPEARS. At once, and often in successive crops.

ERUPTION FADES. In a few days, dessicating, as a rule, without suppuration.

DANGER OF CONTAGION. Duration of danger of contagion ends with the shedding of the dried crusts.

TABLE FOR MAKING PERCENTAGE SOLUTIONS.

TO MAKE FOUR FLUID OUNCES OF THE SOLUTION.

Per cent.	Grains for Exact Solution.	Approximate Amount required to make 4 fl. oz.		Distilled water q. s. to make 4 fl. oz.
		grains	14-5	
1-10 of 1%	1.82	grains		
$\frac{1}{8}$ of 1%	2.28	"	$2\frac{1}{4}$	
1-6 of 1%	3.03	"	3	
$\frac{1}{4}$ of 1%	4.55	"	$4\frac{1}{2}$	
$\frac{1}{3}$ of 1%	6.06	"	6	
$\frac{1}{2}$ of 1%	9.10	"	9	
1%	18.20	"	$18\frac{1}{4}$	
2%	36.40	"	$36\frac{1}{2}$	
$2\frac{1}{2}$ %	45.50	"	$45\frac{1}{2}$	
3%	54.60	"	$54\frac{1}{2}$	
4%	72.80	"	$12\frac{1}{2}$	
5%	91.00	"	$11\frac{1}{2}$	
6%	109.20	"	1	
7%	127.40	"	2	
8%	145.60	"	2	
10%	182.00	"	3	
12%	218.40	"	3	
15%	273.00	"	4	
20%	364.00	"	6	
25%	455.00	"	7	

DIRECTIONS.

Find in the first column the per cent. desired. The second column shows the exact amount required in grains. The third column shows the approximate amount by weight required of any salt; to this weight add distilled water enough to make four fluid ounces.

AN EPITOME OF IMPORTANT INCOMPATIBLES.

Acacia (gum) with alcohol, iron, lead-water, and mineral acids.

Acids (mineral), with alkalis and relatively weak salts of other acids, such as bromides, chlorides, and iodides.

Alkalis, with acids and with relatively weak salts.

Antipyrin and antifebrin should be given with alcohol or water only.

Arsenic, with tannic acid, salts of iron, and lime and magnesia.

Bitter infusions and tinctures, with salts of iron and lead.

Bromides, with acids, acid salts, or alkalis.

Calomel, with antipyrin, alkalis, lime-water, salts of iron and lead, and iodide of potassium.

Camphor (spirit of) with water.

Carbonates, with acids and acid salts.

Chloral, with cyanides.

Chlorides, with silver salts, lead salts, and alkalis.

Chloroform (except in minute quantity), with water.

Corrosive sublimate, with alkalis, lime-water, salts of iron and lead, iodide of potassium, albumin, gelatine, and vegetable astringents. (It may, however, be advantageously combined with tincture of the chloride of iron and liq. acidi arsenosi, or with iodide of potassium.)

Digitalis, with iron and preparations containing tannic acid.

Iron (salts), with anything containing tannic acid. Tincture of the chloride of iron, with alkalis, carbonates, mucilages, and preparations containing tannic acid.

Mucilages, with acids, iron salts, and alcohol.

Potassium chlorate (and potassium permanganate) should not be rubbed up with tannic acid or other organic oxidizable substance.

Potassium (iodide of), with all strong acids and acid salts. (See Corrosive Sublimate.)

Spirit of nitrous ether, with antipyrin, sulphate of iron, tincture of guaiacum, and most carbonates.

Vegetable preparations holding tannic acid, with salts of iron and lead.

Alkaloids are precipitated or destroyed by tannic acid, alkalis, iodine or iodides, and chlorinous compounds.

Tinctures of gums or resins, with water.

FREEZING MIXTURES.

(THOMPSON.)

Ingredients.	Parts by Weight.	Temperature reduced from 10° C. or 50° F. to
Hydrochloric Acid . . .	8 }	- 17° C. = + 1° F.
Sulphate of Sodium . . .	5 }	
Snow or Fine shaved Ice . . .	2 }	- 18° C. = 0° F.
Chloride of Sodium . . .	1 }	
Dilute Nitric Acid . . .	2 }	- 19° C. = - 2° F.
Sulphate of Sodium . . .	3 }	
Dilute Nitric Acid . . .	4 }	- 26° C. = - 15° F.
Nitrate of Ammonium . . .	5 }	
Sulphate of Sodium . . .	6 }	- 29° C. = - 20° F.
Dilute Nitric Acid . . .	4 }	
Phosphate of Sodium . . .	9 }	

LAWS RELATING TO THE SALE OF POISONS.

Laws of most of the States in the United States, also laws of Great Britain, practically restrict the sale of poisons, when made to others than dealers, to sales by licensed pharmacists, druggists, or chemists. They require that the bottle or package containing the poison be carefully labeled with the name of the poison, the name and address of the seller, and the word poison (usually in red ink). Laws of nearly all the States, likewise the English Pharmacy Acts, not only anticipate that the seller will use discretion in making sales, but also require him to register, in a book kept for the purpose, sales of all very active poisons. The registration includes the name and quantity of article sold, use to which it is to be put, date of sale, name and address of purchaser, with his signature and that of the seller; etc.

In the State of New York the laws virtually require the registration of all poisons.

In Great Britain the purchaser must be known to the vendor or introduced by some person the latter knows, and the signature of both of these must then

appear upon the registration book. The articles to be registered in Great Britain include "arsenic and its preparations, aconite and its preparations, all poisonous vegetable alkaloids and their salts, atropine and its preparations, cantharides, corrosive sublimate, cyanide of potassium and all metallic cyanides and their preparations, emetic tartar, ergot of rye and its preparations, prussic acid and its preparations, savin and its oil, strychnine and its preparations, vermin killers, if they contain any poisons or preparations of poisons which are on this list." (In Ireland, preparations of prussic acid and all vermin killers are omitted from this list.)

QUESTIONS FOR SELF-EXAMINATION.

Selected by the author from over 1,000 questions asked by him at College, and Board of Pharmacy examinations.

(Board of Pharmacy questions are in sets of 15).

N. B.—In giving doses, **write the name of the drug** and give the **minimum** and **maximum** doses.

1. Name two vegetable and three mineral emetics, and state the emetic dose of each.
2. Name a good antidote to the mineral acids.
3. What acid is considered a good antidote to the alkaloids? Why?
4. What alkaloid and what Potassium salt are considered very beneficial in Morphine poisoning? How should they be administered?
5. Which one of the mercurial preparations is most frequently employed for suicidal purposes? What is the best antidote in poisoning by it? How is the antidote used and what is formed?
6. Describe the characteristic symptoms of and give the emergency treatment for Strychnine poisoning.

7. What would you give for poisoning by any of the Barium-salts? For poisoning by any of the Copper salts?
8. State what emergency treatment should be employed for poisoning by Iodine, and for poisoning by Silver Nitrate, naming the chemical antidote for each, if there be one.
9. What emergency treatment should be employed for poisoning by Carbolic Acid? For poisoning by Phosphorus?
10. What precautions should be observed in selling poisons?
11. What relation do hypodermic and mouth doses bear to each other as regards size, and why does the former act more quickly than the latter?
12. What is the dose of Antimonial Powder, Extract of Aconite, Gallic Acid, Oil of Gaultheria?
13. What is the dose of Creosote Carbonate, Red Mercuric Iodide, Sodium Bromide, Sulphonal?
14. What is the dose of Fowler's Solution, Infusion of Digitalis, Syrup of Ferrous Iodide, Syrup of Morphine Sulphate (N. F.)?
15. What is the dose of Fluid Extract of Cimicifuga, Tincture of Nux Vomica, Tincture of Veratrum Viride, Wine of Colchicum Root?

-
1. By what avenues, other than the mouth, may poisons enter the system? By which one of these is the most prompt effect obtained?
 2. What kinds of evidence, besides that called the symptoms, may serve to indicate the poison taken in a case of poisoning? Which of these is considered the most reliable?
 3. Do all poisons produce their poisonous effects in the same time? Illustrate in answer.
 4. What is meant by the local effect of a poison? Name one which has both a local and a gen-

- eral or systemic poisonous effect, and state the emergency treatment for poisoning by it.
5. Name two substances which poison by being inhaled; also name two narcotic poisons, stating the emergency treatment for poisoning by them.
 6. Which would be the more dangerous poisonous dose of Arsenic, a small or a large one? Explain.
 7. What emergency treatment should be employed for poisoning by Laudanum? By Lead salts?
 8. Name a poison, in poisoning by which, fats and oils should not be administered, and one in poisoning by which Sodium Bicarbonate should not be given. Explain.
 9. Name a poison, in poisoning by which an emetic should not be given, and another in poisoning by which water should not be administered. Explain.
 10. What does the Pharmacy Law direct regarding the sale of poisons belonging to "Schedule A"?
 11. State the dose of Ammonium Chloride, Atropine Sulphate, Corrosive Mercuric Chloride, Guaiacol Carbonate.
 12. State the dose of Ferrous Sulphate, Lead Acetate, Salol, Trional.
 13. What is the dose of Antipyrine, Ingluvine, Naphthalin, Strychnine?
 14. State the dose of Diluted Hydrocyanic Acid, Extract of Belladonna, Extract of Hyoscyamus, Oleoresin of Aspidium.
 15. What is the dose of Deodorized Tincture of Opium, Tincture of Strophanthus, Donovan's Solution, Fluid Extract of Viburnum Opulus?
-
1. Name the best chemical antidote for: Corrosive Sublimite; Lead Water; Oxalic Acid; Paris Green; Tincture of Iodine.
 2. Name the best physiological antidotes, with their antidotal doses and your method of ad-

ministration, in poisoning by Aconitine; by Morphine; by Strychnine.

3. What substance is considered a good antidote to the alkaloids? Why? In what dose is it given?
4. Mention two substances which poison by being inhaled. Name two narcotic poisons.
5. Which is the more rapidly fatal poison, Potassium Cyanide or Potassium Hydrate? What emergency treatment should be employed for poisoning by each?
6. What emergency treatment should be employed for poisoning by Formaldehyde? By swallowing Chloroform?
7. Name two stimulants of different character. When is artificial respiration applicable and how is it performed?
8. State the condition of pupils and skin in Belladonna and in Morphine poisoning.
9. Name three good, vegetable emetics with emetic dose of each. What fluid aids emetic action?
10. What does the law require the pharmacist to ascertain and do when selling Carbolic Acid, Laudanum or Strychnine?
11. What proportion of the adult dose of a medicine should ordinarily be given children at the following ages: 2, 4, 8, 10, 14 years?
12. What is the hypodermic dose of Morphine Sulphate, Strychnine Sulphate? What is the rectal dose of Cocaine, Chloral, Extract of Belladonna?
13. What is the dose of Mild Mercurous Chloride, Sodium Benzoate, Strophanthin, Urethane?
14. What is the dose of Extract of Colocynth, Extract of Digitalis, Lugol's Solution, Spirit of Chloroform, Tincture of Hyoscyamus?
15. What is the dose of Acetanilid, Silver Nitrate, Sodium Salicylate, Tincture of Conium, Tully's Powder?

1. What should be given for poisoning by Mercuric Chloride? By any of the Zinc salts?
2. In Morphine poisoning, what oxidizing agent is employed and what alkaloid should be used for its physiological effects?
3. Name two different substances which may produce eschars or stains on the lips or mouth?
4. How would you determine whether a suspected powder was Calomel, Corrosive Sublimate, or Morphine Sulphate?
5. What is meant by circumstantial evidence? symptomatic evidence? chemical evidence? Which is the most reliable?
6. Describe the characteristic symptoms of and give the emergency treatment for poisoning by Belladonna. For poisoning by Opium.
7. What emergency treatment should be employed for poisoning by Paris Green? By Salt of Sorrel? What is Paris Green? What is Salt of Sorrel?
8. What antidote, and how much, should be given for poisoning by Iodine? By Lunar Caustic?
9. What is the dose, and antidote for overdose, of Mercuric Cyanide? Of Tincture of Belladonna?
10. What is the dose of Benzoic Acid, Digitalin, Salicylic Acid, Potassium Iodide?
11. What is the dose of Agaricin, Colchicin, Convallarin, Extract of Stramonium?
12. What is the dose of Creosote, Fluid Extract of Ergot, Methyl Salicylate, Oleoresin of Cubeb?
13. What is the dose of Tincture of Aconite, Compound Tincture of Catechu, Tincture of Colchicum Seed, Tincture of Ipecac and Opium?
14. How large a dose of each of the following should you consider it safe, as a rule, to dispense in a prescription: Cocaine Hydrochlorate, Extract of Physostigma, Veratrin, Wine of Opium?

15. What is the dose of Mixture of Rhubarb and Soda, Syrup of Garlic, Wine of Antimony, Wine of Ferric Citrate?
-
1. Define Toxicology, Antagonist, Corrosive, Narcotic, Ptomain.
 2. Upon what does the rapidity of absorption of a poison depend?
 3. Describe the condition of the stomach after a large quantity of undiluted Carbolic Acid has been swallowed.
 - (a) Is the corrosion superficial or deep?
 4. What are the symptoms of and what emergency treatment should be employed for poisoning by Oxalic Acid?
 - (a) Should the stomach tube be employed and should alkaline carbonates or bicarbonates be administered? Explain.
 5. What signs and symptoms would indicate poisoning by Sulphuric Acid?
 - (a) State what emergency treatment should be employed and explain regarding use of emetic, Sodium Bicarbonate and much water.
 6. What emergency treatment should be employed for poisoning by Arsenic?
 - (a) By Tyrotoxon?
 7. What emergency treatment should be employed for poisoning by Cocaine?
 - (a) By Trional.
 - (b) State the proper dose of each.
 8. Name three unrelated, mineral emetics, with dose of each.
 - (a) Name three unrelated poisonous alkaloids (not mentioned in this paper), with dose of each.
 - (b) Name five poisonous tinctures, with dose of each.
 - (c) Name five demulcents and state for what poisoning such are employed.

9. State the effect upon the heart and stomach, of the habitual, excessive use of Alcohol.
(a) Of Tobacco.
 10. What are the principal effects of the habitual use of Cocaine?
(a) Of Morphine?
-
1. Define Toxicology, poison, cumulative poison, demulcent.
 2. Into what general classes are poisons physiologically divided?
(a) Name the first subdivisions of these general classes and mention a poison belonging to each subdivision.
 3. What should be done in poisoning when the nature of the poison is unknown?
(a) By what may the effects of a poison be modified?
 4. State and illustrate the difference between an antidote and an antagonist.
(a) State and illustrate the difference between antidotal measures and antagonistic measures.
 5. In what kinds of poisoning should the following be avoided: emetics, the stomach pump, the stomach tube, glycerine, milk?
 6. Name a drug acting directly upon the heart and give the treatment for poisoning by that drug.
(a) Name a poison directly affecting the stomach, and give the treatment for poisoning by it.
 7. Name a common household article of which Phosphorus is an ingredient.
(a) Should oil be used in poisoning by Phosphorus? Explain.
 8. When should the following be employed as chemical or mechanical antidotes: Potassium Permanganate, Sodium Chloride, starch, Tannic Acid, Alcohol? Explain.
(a) What is the treatment for poisoning by Wood Alcohol? By Opium?

9. State the emetic doses of two vegetable and of three mineral emetics.
 (a) What is ordinarily the largest safe dose of Aconitine, Paraldehyde, Dover's Powder, Heroin, Phenacetin?
10. What are the symptoms of and what is the proper treatment for poisoning by coal gas?
 (a) Name a poison which uniformly produces blindness, more or less permanent.

MISCELLANEOUS COLLEGE AND BOARD QUESTIONS.

1. What effect does the dilution of a corrosive poison have upon its local effect?
 (a) If an ounce of Carbolic Acid, well diluted, were swallowed, would life be endangered? Explain.
 (b) What is the official antidote for poisoning by Arsenic, and how is it prepared?
2. What is the best chemical antidote for poisoning by Silver Nitrate, and what does it do?
 (a) For poisoning by Chloral and what does it do?
 (b) For poisoning by Verdigris?
 (c) What symptoms would cause you to suspect Opium poisoning?
3. Is it the absorbed poison in the circulation, or the unabsorbed poison in the stomach, which causes death by a true poison?
 (a) What is the proper demulcent antidote to employ when Chlorine preparations have been swallowed?
 (b) What Sodium salt should also be used?
4. What emergency treatment should be employed for poisoning by swallowing a Formaldehyde solution?
 (a) For poisoning by Hyoscyamus?
 (b) By Ice Cream?
5. Name a good physiological antidote for poisoning by Aconite, and tell how to use it.
 (a) How may Oxalic Acid be distinguished from Epsom Salt?

(b) Should water be used in poisoning by Oxalic Acid or by Oil of Vitriol? Explain.

6. With what substances does albumin form more or less inert compounds?

(a) Describe the method of using it.

(b) What precautions are to be observed in employing it in poisoning by Corrosive Sublimate, and why?

7. What are the principal symptoms produced by a toxic dose of Strychnine?

(a) State the emergency treatment for poisoning by Strychnine, giving the object of each procedure in the treatment?

8. Should the following prescription be dispensed? Explain.

℞ Heroin, gr. $2\frac{1}{2}$

Codeinae Sulph.

Ext Hyoscyami, aa gr. 10

Pulv Tully, dr̄m 3

M ft in caps No. XXIV.

Sig. Two every 2 to 4 hours.

9. If a wineglassful of concentrated Hydrochloric Acid were swallowed would death be likely to result if no treatment were employed? How could you tell it was not Carbolic Acid instead of Hydrochloric?

10. Which is the more rapidly fatal poison, Potassium Cyanide or Potassium Hydrate? To what is the effect due? What emergency treatment should be employed for poisoning by each?

11. By what chemical tests or means would you identify the following: Mercuric Chloride; Morphine; Antipyrine; Strychnine?

12. Poisoning by what drug would be indicated by the following symptoms: flushed face, thirst, dry fauces, double vision, dilated pupils, giddiness, delirium and stupor? What treatment should be employed?

(a) In true poisoning by coal gas, where is the poison and what treatment should be employed?

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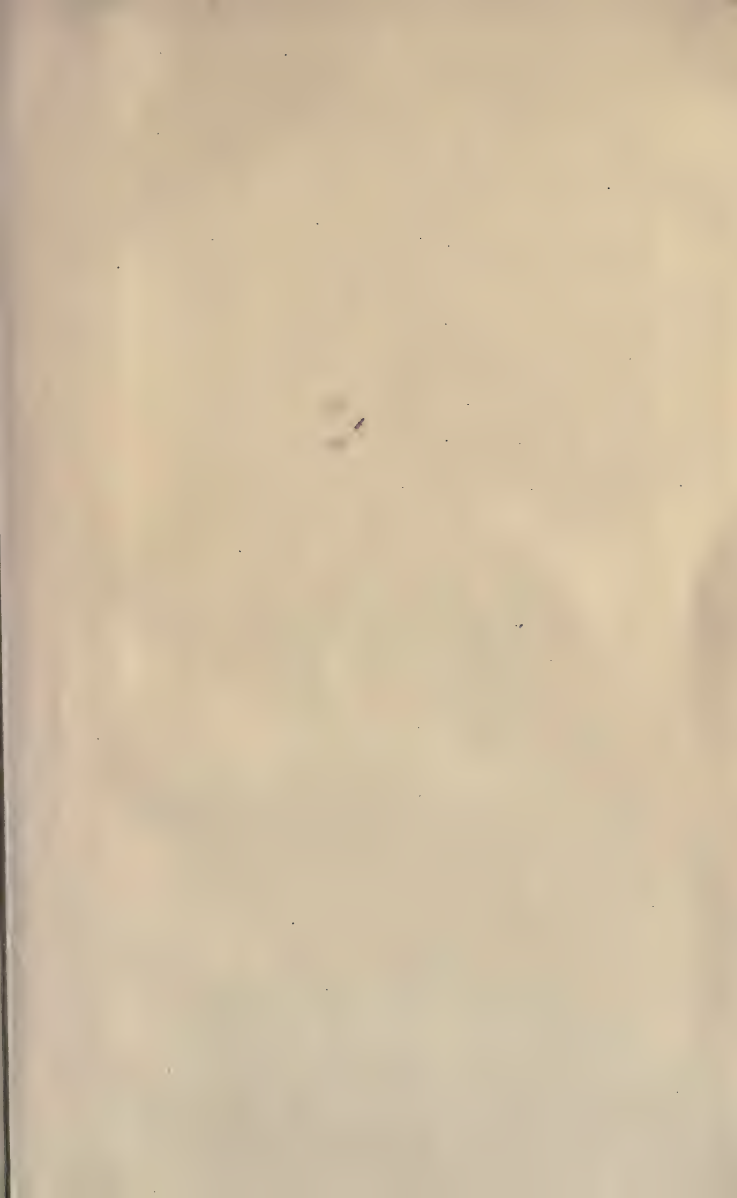
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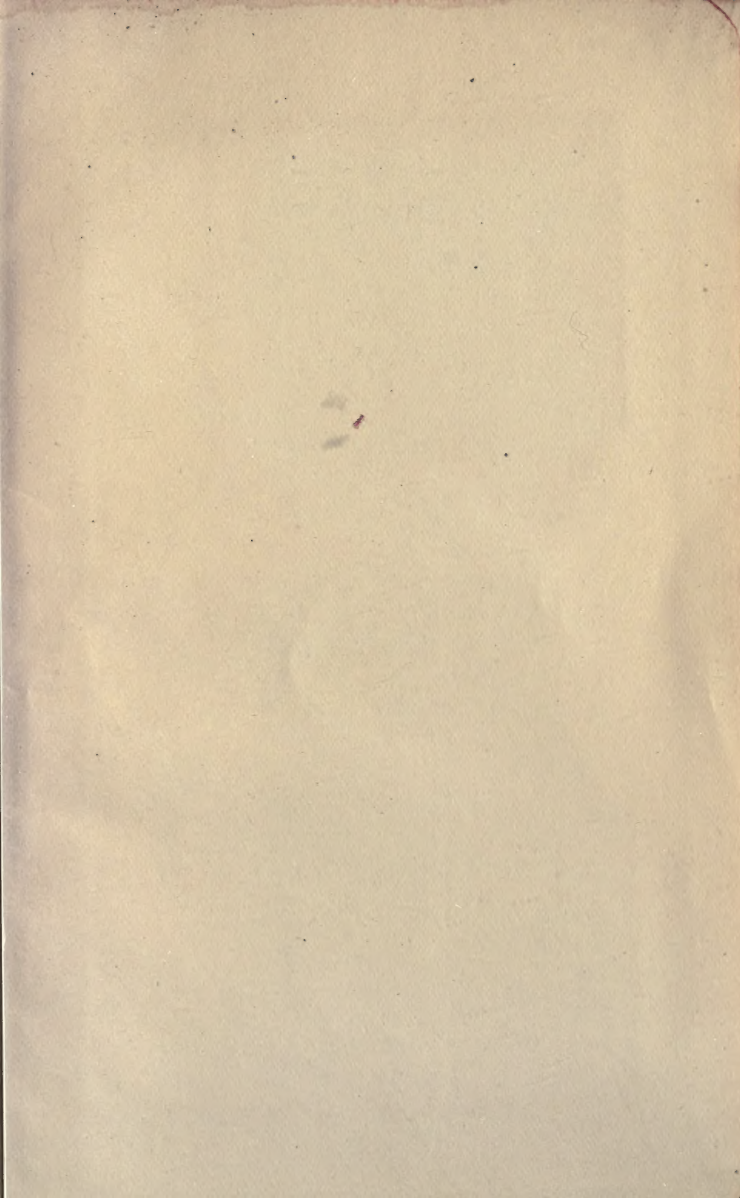
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ADDENDA.

A chapter on Pharmacological Toxicology has been inserted under Part VII for convenience of reference, although not strictly related to the same.







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